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SUDAN NOTES AND RECORDS

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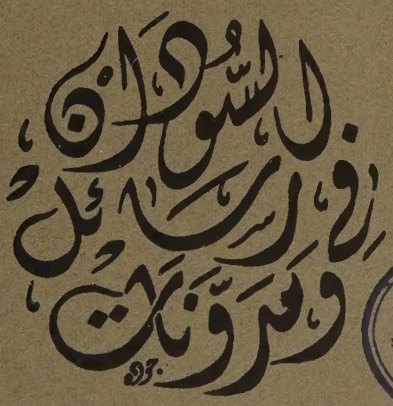
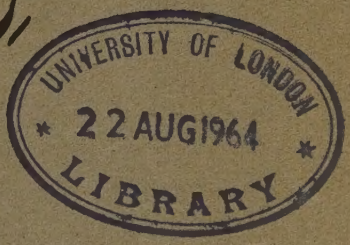
Proceedings of the
Philosophical Society
of the Sudan





المندمجة فيها وقائع الجمعية الفلسفية بالسودان

1961

VOLUME XLII DOUBLE NUMBER

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السودان فى رسائل ومدونات

SUDAN NOTES AND RECORDS

Incorporating Proceedings of the Philosophical Society of the Sudan

FOUNDED 1918

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VOLUME XLII DOUBLE NUMBER
KHARTOUM, 1961

Transliteration of the Arabic Alphabet

adopted by the Editors of *Sudan Notes and Records*

ا	at beginning of word omit, hamza (') elsewhere	ذ	dh (coll. d)	غ	gh
		ر	r	ف	f
		ز	z	ق	q (coll. g)
ب	b	س	s	ك	k
ت	t	ش	sh	ل	l
ث	th (coll. t or s)	ص	ṣ	م	m
ج	j or g	ض	ḍ	ن	n
ح	ḥ	ط	ṭ	ه	h
خ	kh	ظ	ẓ	و	w
د	d	ع	‘	ي	y

VOWELS

fatha	a,	lengthened	ā
kasra	i,	,,	ī
damma	u,	,,	ū

The ل of the article always remains *l*.

The silent *t* (ة) is omitted.

DIPHTHONGS

ى—ai (as in aisle).

و—au (as in mauser).

NOTES

1. The system is not applied to well-known names, such as Khartoum, Omdurman, etc.

2. The vowel sounds of *e* in 'get' and *o* in 'hot' with the corresponding long vowels (*a* in 'gate' and *o* in 'home'), which occur only in the colloquial, are expressed by e, o, ē, ō.

e.g. beled, Mohammed, bēt (or beit), hōsh.

Ei may be used as alternative to show the long ē.

3. In geographical names the conventional spelling used by the Sudan Government Survey Department is followed, although not always agreeing with the above transliteration.

4. At present phonetic type is not available for proper reproduction of non-Arabic African languages.

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25°E
30°
35°
UNITED ARAB REPUBLIC
Wadi Halfa
LIBYA
20°
NORTHERN
Port Sudan
Karima
Atbara
ED DAMER
REPUBLIC OF CHAD
DARFUR
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Nyala
ErRoseires
ETHIOPIA
10°
MALAKAL
BAHR EL GHAZAL
UPPER NILE
REPUBLIC OF CENTRAL AFRICA
WAU
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SUDAN NOTES AND RECORDS

INCORPORATING

PROCEEDINGS OF THE PHILOSOPHICAL SOCIETY OF THE SUDAN

VOL. XLII DOUBLE NUMBER 1961

EDITORIAL

This volume of *Sudan Notes and Records* is the last for which the present Editor will be responsible. As from Vol. XLIII (1962) the editorship will be in the hands of Dr I. G. Cunnison, Head of the Department of Social Anthropology in the University of Khartoum.

The retiring Editor wishes to thank all those who have contributed material for publication during his term of office, and who have by so doing maintained the world-wide reputation of *Sudan Notes and Records* as an important scholarly journal. He also wishes to express his appreciation of the loyal support given by subscribers and readers, whose patience has been too often tried by delays in publication; and to acknowledge the enlightened interest of the Government of the Republic of the Sudan, without whose financial assistance the continued publication of this journal would not have been possible.

Sudan Notes and Records has always attempted to satisfy a wide range of scholarly interests; and it is hoped that, over the years if not always in any one particular number, readers will have found articles devoted to their own special field. But to cater for experts in their own field of specialization has never been the only or even the principal function of *Sudan Notes and Records*. The main justification for the existence of a journal covering so wide a range of subjects is that it gives the interested layman some idea of the scope and progress of Sudan studies, and at the same time assists the specialist to keep in touch with work outside his own specialism.

Within the last few years work in Sudan studies has greatly increased in range and volume; and the time has probably come for the rapid development of specialized journals within this field. One such publication, the archaeological journal *Kush*, has already been in existence for some ten years and has acquired a very distinguished reputation. Others will doubtless follow its example. But these developments will surely add to, rather than detract from, the value of a journal like *Sudan Notes and Records*, which popularizes the broader results of research and from time to time publishes material which provides samples of the techniques now being used by specialists in a number of different branches.

It is not only the layman (important as he is), whose interests are served by a journal of this type. In the Sudan, as in other countries, both the academic research worker and the social or economic planner often find that their work takes them well beyond the boundaries of the discipline in which they are specialists. The historian's work may involve questions which require an anthropological answer; the town-planner must acquaint himself with the relevant findings of, among others, the sociologist and the economist. For work on these inter-disciplinary problems, many of which are of great scientific interest or urgent

practical importance, *Sudan Notes and Records* is an indispensable tool of research. It will be an unlucky research worker or planner who does not find within its pages at least some elementary notions of the relevant findings in disciplines other than his own; while the Sudan Bibliographies, and the bibliographies or footnotes appended to particular articles, will furnish a guide to the material in more specialized publications.

Sudan Notes and Records provides periodical progress-reports on Sudan studies for the interested layman; it acts as a handy compendium of "Sudanology" for anyone wishing to make a rapid survey of any particular field; and it furnishes to the specialized worker a sound introduction and a useful bibliographical key to relevant material outside his own specialism. Its breadth of range—its very lack of specialization—enables it in this way to make a unique contribution, not only to the broad dissemination of information about the Sudan, but to the further progress of research in Sudan studies. Long may it continue to do so!

SOME CONCEPTS OF MODERN GEOGRAPHY APPLIED TO SUDAN

by

J. H. G. Lebon

1

Modern geography originated in the life-work of two Germans : Carl Ritter and Alexander von Humboldt. The centenary of their deaths in 1859 was commemorated last year, in Berlin and elsewhere (1)*. Their memory was rightly acclaimed by the entire world of learning, for they stand among the builders of modern knowledge. Their achievement was to replace an older geography consisting of compendia of miscellaneous facts of variable reliability about countries and peoples by a branch of knowledge ranking with the sciences and branches of humane scholarship, based upon accurate observations and disciplined use of written sources. To them is due the introduction of a cardinal concept or doctrine of the subject today, namely, that of *Zusammenhang* or—in English—coherence, interdependence or interrelationship. Geography became not merely earth-description, but earth-description with the aim of disclosing the relationship of the parts or aspects to each other and to the whole. Henceforward, the word *Die Geographie*—the germanized form of the Greek ΓΕΩΓΡΑΦΕ—fell into disfavour, because it was held that geography had passed beyond the stage of mere earth-description. Its place was taken by *Die Erdkunde*, which can only be translated by the phrase "organized earth knowledge", because the literal English equivalent is geology, a term appropriated to the scientific study of the earth's crust.

There is a marked contrast between their principal published writings, which influenced the later development of the subject. Ritter, following the tradition of the Greek geographers (above all, Strabo), but with the addition of *Zusammenhang*, sought to understand and expound the lands and peoples of the world. He did not complete his task ; but he published nineteen volumes of his *Erdkunde* (2), comprising Africa and part of Asia. Humboldt's greatest work was his *Kosmos* (3), which had as its sub-title "Sketch of a Physical Description of the Universe". In it, he sought to describe not only the earth as a whole, giving due place to the living organisms thereon, but the universe outside the earth. He states in the first volume that "in this work I use the word Cosmos in conformity with the Hellenic usage of the term subsequently to the time of Pythagoras. . . . It is the assemblage of all things in heaven and earth, the universality of created things constituting the perceptible world".

Their successors in Germany adhered to Humboldt's aims rather than Ritter's. No follower was brave enough to attempt, by a single-handed effort, another *Kosmos* ; but a school of geographers arose which developed those parts of the Cosmos dealing with the earth itself. To them, geography was knowledge of aspects of the whole earth. Von Richtofen (4), Albrecht Penck (5) and Supan (6) laid the foundations of modern physical geography ; Hann (7) and Köppen (8) of modern climatology ; Drude (9) of plant geography. From Ratzel (10) came systematic works on human geography, political geography and ethnography. The first modern treatise on economic geography was written by Andree and published in 1862 (11).

* See References, pp. 27-28

Ritter's conception of geography was thus somewhat overshadowed in Germany, though its practice did not by any means vanish. But the progress of the modern French school by the work of Elisée Reclus (12) (himself a pupil of Ritter) and more especially Vidal de la Blache (13) brought forth a succession of brilliant studies of France and the regions of France. After the Great War of 1914–18, French university geographers in collaboration produced a universal geography, i.e. a geography of the whole world (14), which has not yet been fully superseded.

Thus, about 1900, systematic or general geography was predominant in Germany ; in France, special or regional geography.

This overemphasis upon general geography did not escape challenge in Germany. Indeed, von Richtofen himself evinced awareness and uneasiness about the path geography was taking when he was beginning his tenure of the chair at Leipzig in 1882 (15). And one of his pupils, Hettner, whose life-work spanned the period from the eighteen-nineties to the thirties of this century, devoted his main effort to redefinition of the scope and method of geography (16). He argued that the true nature of geography is not expressed in general or systematic geography, but in Ritter's interpretative scrutiny of the earth area by area. He pointed out that Ritter had revived, as a synonym for *Die Erdkunde*, a word which had been current in the sixteenth and seventeenth centuries—chorography ; and alluded frequently to the chorographical or chorological nature of his subject (ΧΟΡΟΣ, land).

Hettner justified his doctrine from the historical development of the subject and from a theory of knowledge. He reiterated that knowledge of the external world is three-dimensional : knowledge of events in time, which is historical knowledge ; knowledge of things according to their categories or constitution, which is scientific knowledge ; and knowledge of the distribution of things in space, which is geography, insofar as it is concerned with the earth's surface. General geography and associated sciences are however essential prerequisites to geographical study ; and recourse is also necessary to the results of historical study, since although the true and principal object of geography is elucidation of the association of phenomena at and over the earth's surface as they are, these cannot be fully understood unless the past is invoked in interpreting the present. During the present century, Hettner's view has gained increasing support, and may fairly be said to constitute orthodoxy in doctrine among geographers today : though there are still some individuals and small schools giving priority to the separate sciences concerned with the earth, who give the supremacy to what they term systematic study, and prefer to regard regional or chorological study as a by-product.

Also, there has been a continuing controversy upon the two main problems of geography, chorologically conceived : first, how to undertake scientific study of the welter of phenomena and their interrelationships, confronting anyone who attempts to study geographically even a small area of the earth's surface ; secondly, how to define man's place in geography. The interrelation of natural forces over the surface is readily comprehensible ; and so is the relationship between the natural features of the surface and life, both plant and animal life. There is a term and a definition for the relevant branch of science—ecology ; but man's nature and activities put him partly within and partly outside the scope of ecology, thus defined. Man as a creator confronts us. Some of man's creative acts are, evidently, the result of purposeful or incidental alteration or innovation in the existing web of interrelationships, and as such are clearly geographical ; but quite apart from such realms as art, conduct and religion, human choice, individually and in groups, is constantly posing the question : where do we begin and where do we end in

considering the human aspect of a particular terrestrial interrelationship. To take an example which is quite topical; the High Dam. Its interrelationships with the Nile valley, the Nile régime, the natural conditions of Egyptian agriculture, are readily comprehended within the scope of geographical study. But the High Dam is an alternative to the Jonglei Scheme; an alternative which has been chosen by societies—political societies—in preference to the Jonglei Scheme. How far, in geographical studies, do we proceed to analyse the particular phase of Egyptian nationalism and the Cold War which has led to the adoption of this scheme as the next stage in Nile control?

Aba Island offers another illustration. The abode of a few fishermen during the Mahdi's preparation for his mission, and deserted thereafter during the first half of the Condominium, it was the scene of remarkable changes after Sayed Abdel Rahman came to be regarded with greater benevolence by the government from about 1927. The island was permitted to be transformed into a pump scheme growing both field crops and fruit trees. A large population of adherents and dependents of the Mahdi's successors were settled thereon. The largest settlement—Er Rahmaniya—is a small, planned town, having one of the Mahdist residences and a garden as its central feature. In short, another oriental pilgrimage city has come into existence in our own generation. But how far does a geographer, engaged in chorological study of the earth's surface, delve into the origins and contemporary significance of Mahdism in the Muslim world?

Eschewing the temptation, in this address, to elaborate these problems *per se* (and in so doing perhaps risking the accusation that I am retreating instead of giving battle), I turn to provide hints of solutions which have been and are being applied in geographical study. The geographer's immediate reaction to the multiplicity, diversity and immensity of areal interrelationships over the earth's surface and human creativity is to proceed with the task of discovering regions. Interrelationship between the earth's crust, the atmosphere, and life is such that particular types of relationship prevail with little modification over small or large tracts. Thus, to give a single example, aridity or absence of rainfall is reflected both in land forms and in the presence of limited and very specialized forms of animal and plant life; and thus imparts a degree of homogeneity to a large or small tract of the earth's surface. This homogeneity never extends to the totality of geographical phenomena; but it may well be important or dominant. The recognition of regions which are characterized by interrelationships with aridity, and their delimitation, is therefore a means of introducing some order into the apparent chaos besetting us when we begin geographical study; and the concept of the region is clearly a powerful aid to the organization of geographical knowledge. It may even be said that the study of regions is the everyday task of the geographer. I doubt whether lectures in regional geography are ever given without defining and expounding some system of division of a part of the earth's surface on the basis of one or more sets of defined interrelationships; yet the theoretical basis of regional division is far from being agreed, and seventy-five years of argument has certainly not yet produced clear doctrine. The geographer, like the physician before the discovery of germs and antibiotics, does his best in the face of phenomena which evade comprehension; but which can sometimes be conjured into a plausible form accepted by other geographers (who know the difficulties) and by any layman who wants geographical knowledge. But he longs for more certain principles and procedure.

One of the answers to the problem of man's place in geography has been

propounded by those who, for want of a better term, may be called the Landscape School. This concept of geography, and principle of separating those aspects of human activity which are geographical from those which are not, was clearly stated by Albrecht Penck, the great German geographer and geomorphologist, before the turn of the century. He stated: "Everything which man has created in visible culture-works on the earth's surface, belongs to the realm of geography". "The content of landscape is the content of the new geography" (17). The seeds thus sown by Penck grew in the mind of a pupil, Schlüter, who restricted geographical study to what is to be seen on the earth's surface; including, of course both what is static and what is mobile, the natural as well as the human (18). This is the geography of the visible. Schlüter was followed in France by Jean Brunhes, who in an influential treatise (19) argued that geographical study of the human element in areal differentiation is fundamentally concerned with three sets of facts: 1. those related to unproductive use of the earth (*a*) houses (*b*) routes; 2. those related to man's use of animal and plant resources; 3. those related to the destructive use of resources—mineral and organic. Thus he provided a classification of the categories of geographical facts due to human activity and forming part of landscapes. Slightly later, after the First World War, Siegfried Passarge published a series of works in which he identified geography with *Landschaftskunde* (20); and about this time the school also became influential in America, through the publication of a long essay on "The Morphology of Landscape", by Carl Sauer in 1923 (21). Two college text books of geography—one by James (22), the other by Finch and Trewartha (23), were published in the decade after 1930, and were expositions of the concept that geography is the study of the visible natural landscape or as modified by man.

The Landscape School has probably weakened as a force potentially capable of becoming a new orthodoxy in geography; but, like many heterodoxies which have been powerful and have aspired to dominancy, as it wanes it leaves the subject it has agitated permanently enriched in theory and method. By focusing and concentrating attention on the landscape, great gains may be achieved in the task of comprehending the apparently overwhelming complexity of facts and relationships in an area.

It may also be remarked that the ideas of the school, and their application, are in very real measure a reaction of general upon special or regional geography. S. Passarge's attempt to develop a theory of landscape (24) and to apply it on the European geographical scale—much smaller than the African, and thus within the scope of chorological study—was undoubtedly inspired by Köppen's demonstration of the basic rôle of climate and its far-reaching influence in the whole range of relationships with which geography is concerned. This will become immediately apparent as we now turn to the theory itself and its application to Sudan.

2

If we take the landscape as the object of geographical study, we are faced by areally distributed features, some of which are of natural origin, and are unmodified by man; others are natural, but modified; and yet a third category that are the direct product of human workmanship, although their nature and position enables us to discern a relationship with their surroundings. It has been taken as axiomatic by most exponents of this conception of geographical research that the starting point of landscape analysis is the determination or visualization of the natural landscape, i.e. the landscape before man entered and began to modify it. In countries such as Sudan, in which population is not dense, and the totality of human effort has been

small, portions of landscape which are the unaltered work of Nature can be discovered, examined and our observations therein can be applied to areas which have been occupied by man. Now, S. Passarge defined the natural landscape as the combination

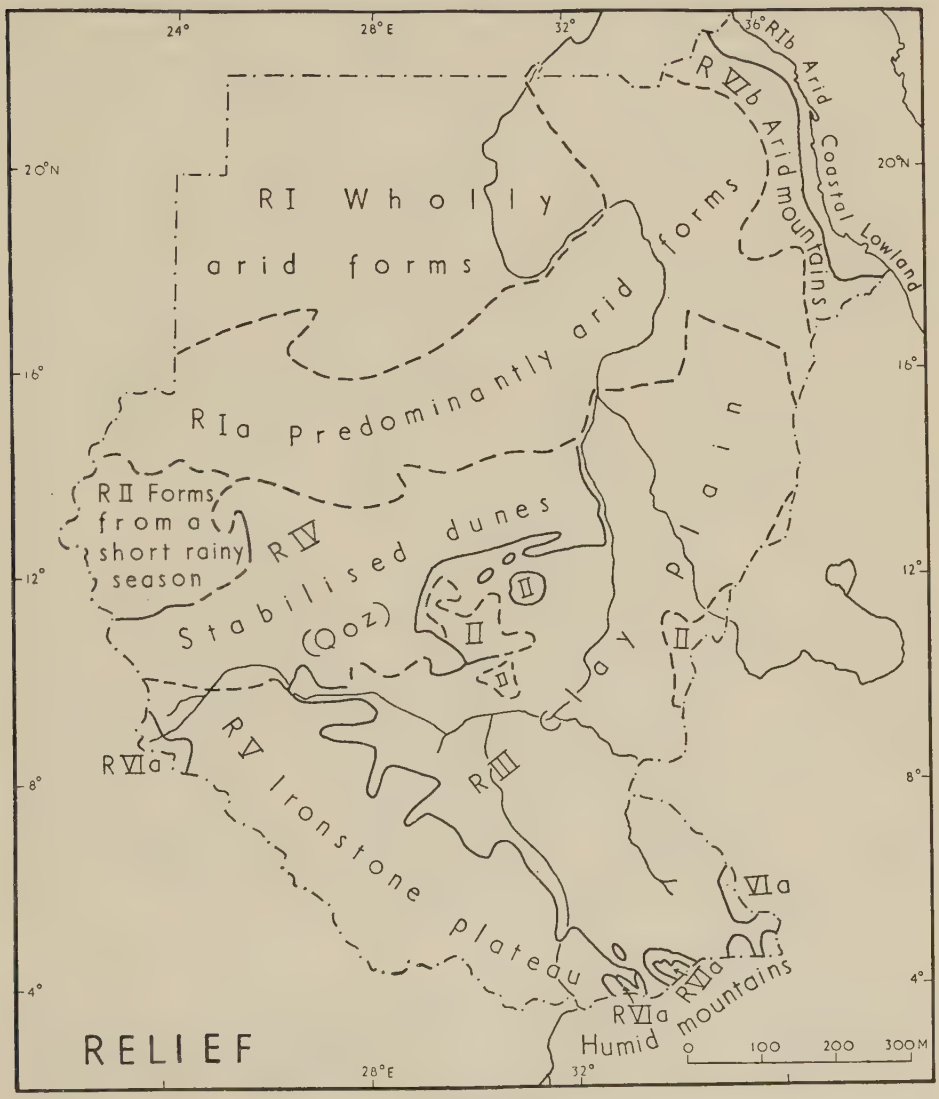

FIGURE 1

of land-forms, hydrology, natural vegetation and soils. The accompanying series of maps depicts these elements for Sudan (25).

The RELIEF of (Fig. 1) is mainly plateau and plain, though locally hills and mountains appear. The northern third of the country is mainly plateau (R I), on which the relief forms are the product of a climate which is *wholly arid*. Sand dunes,

gravel and rock platforms swept by the wind, and rocky hills without soil reign absolutely in the north-west (R Ia), but along the eastern and south-eastern margin is a zone in which running water has left its mark upon the relief; in the shape of ravines in the hills, and a few larger watercourses, some of which are tributary to the Nile; but *predominantly arid* forms are manifested. To some extent, these features are the legacy of a period when the climate was rainier than at present; but total effacement by the agencies of arid land-modelling has been prevented by the occasional showers. (On these maps, clear-cut boundaries are shown by continuous lines, and transitions by broken [pecked] lines.) In Darfur and, to a lesser extent, in the Nuba Mountains, Archaean rocks, much denuded in earlier geological eras, are now exposed to the alternation of complete drought and *short rainy season* of a semi-arid climate (R II). Isolated hills, or mountains, with steeply-scarped flanks surrounded by rocky or gravelly pediments are the origin of numerous seasonal watercourses, which unite in major *wadis*. In Darfur, the volcanic Jebel Marra mountain range is a dominating feature and the originating centre of the main valley system, characterized by broad, gravelly or silty flood-plains often fringed by silt terraces (26). In the east and south-east is the *Clay Plain* (R III), featureless apart from small rocky hills in the north, which have not been quite engulfed in the prolonged sedimentation. Contiguous with the main Clay Plain are extensions into and among the Nuba hills. West of the White Nile, north and west of the Nuba Mountains, and extending to the edge of the Archaean rocks in Darfur is the great expanse of *stabilized sand dunes* (R IV), often called by its Arabic name, the *Qoz*. It is a remarkable legacy of the climatic fluctuations of the Pleistocene period or Great Ice Age of the northern continents; for it is nothing more nor less than a former sand desert which has been mantled by grasses and scrub since annual light rains have succeeded to complete drought. It still preserves the undulations of the former mobile dunes. In the south-west, and flanking the frontier with the Congo, central African and Chad republics is another outcrop of Archaean rocks; but subject to much heavier rainfall, and clothed with forest. It therefore exhibits the more rounded land forms which result from weathering under humid conditions, and its perennial or near-perennial streams have eroded a ramifying pattern of valleys. From the presence of a lateritic pavement—a product of the weathering of such rocks in humid tropical climates—it is commonly called the *Ironstone Plateau* (R V). Mountains are not extensive in Sudan. In the south, close to frontiers, are the Imatong Mountains, the Dongotona Hills and the Boma Plateau; all deeply denuded by mountain torrents; but yet with rounded, forest-clad slopes (R VIa); to the north-east are the Red Sea Hills, broken, rugged, and very rocky, from the effects of weathering under *semi-arid* or *arid* conditions (R VIb).

A wide range of HYDROLOGICAL CONDITIONS (Fig. 2) is produced by the climate in combination with relief and the properties of superficial deposits. In the north-west (H I) the desert is *without drainage*, even ephemerally; and wells are extremely rare. The desert is fringed (H Ia) to the east and south-east by a zone in which there is *scanty intermittent drainage* in rare watercourses from erratic rains. Still further south, in the latitude of regular annual rains (H II), Darfur, the Nuba Mountains, and the northern Clay Plain, have *seasonal drainage*. The southern and greater part of the Clay Plain reveals a peculiar hydrological régime (H III) which results from the heavy summer rains and the extreme levelness. Normal drainage by runoff is absent; the rain stays where it falls, and is augmented by overflow from rivers. So a vast area becomes a seasonal swamp from about May to November. Near the main rivers are smaller areas of permanent swamp, not

outlined on these maps. There are also small areas of slightly higher land, including natural levées, which are less liable to inundation. The *Qoz*, as a consequence of its loose, unconsolidated nature, is very porous, and rainfall sinks beneath the surface

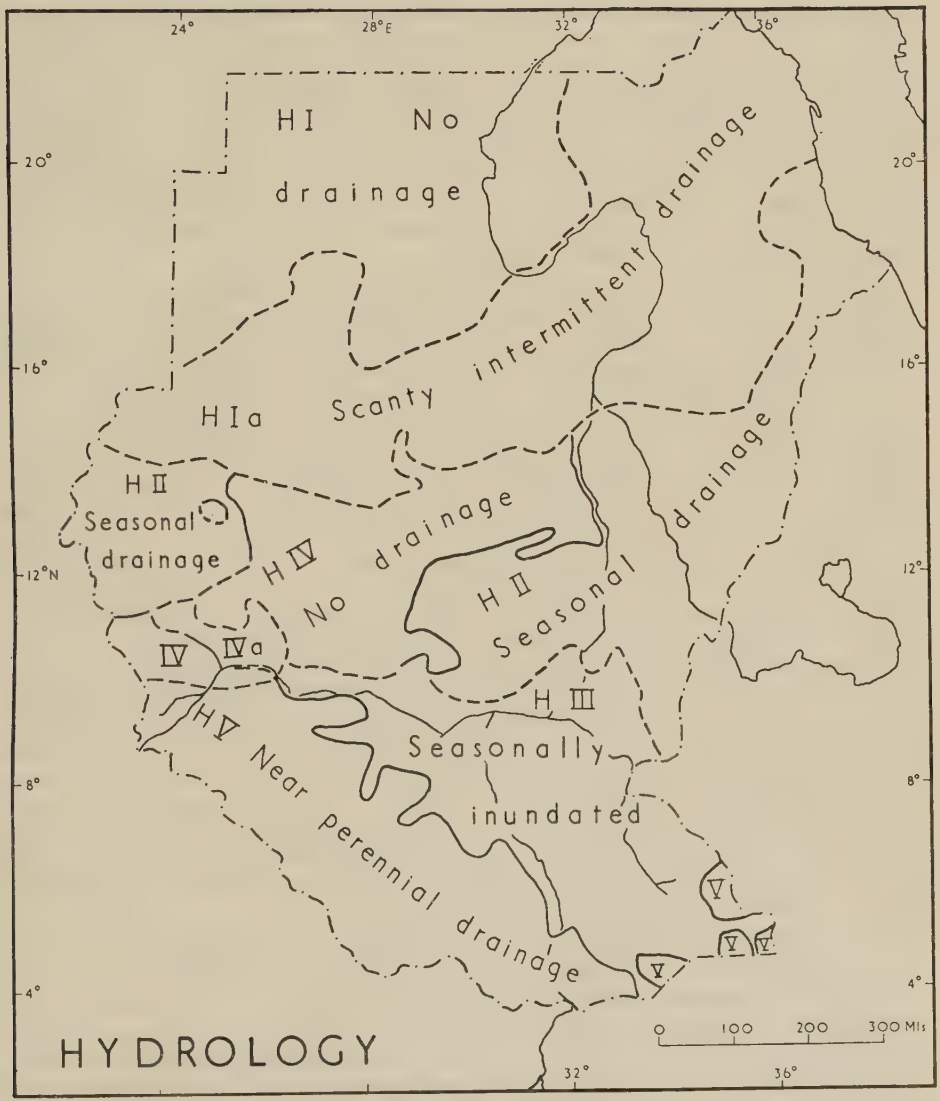

FIGURE 2

as it falls. There is *no surface drainage* (H IV). A small area in the south-west of the *Qoz* is characterized by an alternation of dunes with small clay depressions, or imperfectly-formed drainage channels. This is sometimes called the *Baggara* catena (H IVa), because there is a defined pattern of soils and vegetation accompanying this hydrological feature, and the pasturage is especially esteemed by Arab

cattle-herding (Baggara) tribes. The Ironstone Plateau, already mentioned (H V), has *perennial* or *near-perennial* streams.

At this point we must pause to consider the Nile and its major tributaries, which have been inserted on these maps to serve partly as locational aids. To what extent is this river system exotic, or an essential feature of the natural landscape types ? It is easy perhaps to argue that on the southern Clay Plain, the converging Nile and its tributaries, together with attendant marshes, are an integral part of hydrology. But farther north the White Nile, Blue Nile, Rahad, Dinder and Atbara are at least in the strict hydrological sense exotic ; their entire discharge is begotten of rains falling elsewhere. North of Atbara the Nile valley is simply an elongated oasis in the midst of desert. Here, it may be argued, the Nile is an intrusion upon natural landscapes which, mainly under the control of an arid climate, normally lack perennial streams.

The entire range of VEGETATION TYPES (Fig. 3) observable in hot lands occurs within Sudan, from the desert of the north to true tropical rain forest in the south. A whole sequence of vegetation zones, each characterized by the dominance of certain plant associations, has been recognized by Messrs Harrison and Jackson (27). They have also recognized local types upon the basis of edaphic conditions. By grouping together some of the minor types, six main vegetation zones may be discerned. The first, in the north-west, the *desert*, is void of plants (V I). To the south and east, in the zone of light and erratic rainfall, is the *semi-desert* (V II), in which the plant mantle is incomplete, and displays the effects of water concentration by drainage or in suitable superficial deposits, and is characterized by sparse, low shrubs, some small annual herbs and short grasses, with scattered, dwarf thorny shrubs, mainly of the *Acacia* genus. Again to the south, and extending across the entire country, is the zone of *open savanna woodland*, with short to medium grasses (V III). The plant mantle is complete ; for the shrubs and small trees of the *Acacia* genus, which are dominant, are taller and more numerous than to the north. Broad leaved trees especially of the *Combretaceae*, make their appearance towards the southern margin. Much of the Ironstone Plateau is mantled by *deciduous woodland savanna*, in which full-grown trees sometimes merge their canopies to form thickets or gallery forests, and tall perennial grasses are abundant. Especially in the rainy season, the vegetation is luxuriant (V IV). To the east, in the same latitudes, is the seasonally-flooded part of the Clay Plain. As a result, the growth of trees is impeded, and tall perennial *swamp grasses* are dominant or exclusive (V V). But there is a vegetation catena, extending between the giant sedges of the perennial marches to palm thickets on the "high" land (28).

Rain-forest, or woodland derived from rain forest, is of small extent, and occurs close to the Congo and Uganda frontiers in the extreme south (V VI).

The fourth element of the natural landscape is SOIL (Fig. 4) ; and I have been fortunate in obtaining, from Dr G. A. Worrall, an advance copy of the soil map of Sudan on a scale of 1 : 4,000,000 which he completed only this year (1960) (34). He distinguishes nine principal soil types in the country, which are disposed in part zonally and in part according to relief and the nature of the parent material. A large area in the north and north-west is classified under the heading of "*desert lithosols* and rocky slopes of mountains in the arid zone" (S I). This is really synonymous with absence of true soil, for which organic activity is necessary. On the south-western margin, in northern Kordofan and Darfur, where sand is extensive and there is sparse vegetation, he distinguishes a *gizu* type (S II), or *slightly stabilized sand*. Again to the south, and extending across the entire country, are "*slightly*

stabilized thin sandy and thin lithosolic soils of the semi-arid zone" (S III). These two types (II and III) may be regarded essentially as weathered material from the surface rocks or other deposits, but little modified by organic processes. The

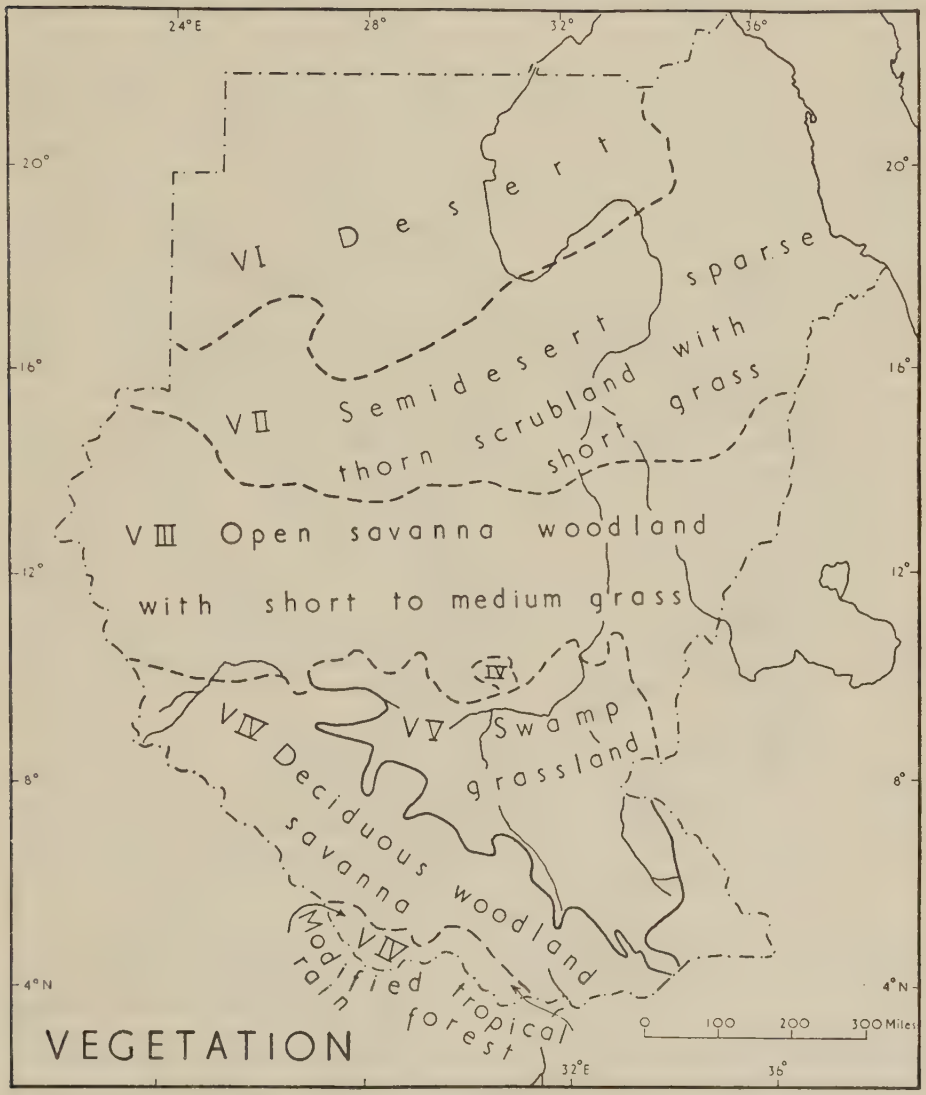

FIGURE 3

Qoz proper is characterized by "*red stabilized sand* soil" (S IV); and this perhaps may be regarded as the first true soil in the sequence. It owes its characteristics to seasonal water movements, and an organic cycle. It also possesses stratification distinguishable from the underlying parent material. Central Darfur presents an association of soil types (S V), rather than a single uniform type. Dr Worrall's

description is: "*Basement complex soils of Darfur*, with lithosols, colluvial soils and local alluvium". The Clay Plain reveals two principal soil types: first, *alkaline clay soils* of the northern portion, not flooded during the rainy season;

FIGURE 4

(S VI) second, the soils of the southern portion which owe their characteristics partly to *annual inundation* (S VII). The Ironstone Plateau of the south-west bears *red latosols*, i.e. soils which are acid in reaction and are not only leached by the abundant downward percolation of water during the long rainy season, but contain the products of chemical reaction resulting in laterite or substances akin to laterite

(S VIII). The remaining class of soils is local, and occurs on steep mountain slopes in the semi-arid and humid zones of the centre and south (S IX). These soils are *skeletal*, i.e. lacking in continuity and unformity, as a result of the rapid erosion and removal of waste on steep slopes.

The NATURAL LANDSCAPE, thus composed of the relief, hydrological characteristics, natural vegetation and soils, exists throughout the land area of the globe, or, to be more precise, existed before man began his extensive alterations to the face of the globe. The earth's surface, so conceived, may be divided into three categories of area. First, those in which landscape types may be discerned. For a landscape type to exist, there must be homogeneity, over a discernible area, of all four elements of the natural landscape. Such areas must be demarcated by boundaries, having either the character of comparatively clear-cut lines, or of sharp transitions over relatively narrow belts or zones. Secondly, those in which a pattern or association of two or more landscape types may be discerned. One or more element in an area may be homogeneous ; others may be non-uniform, and may show a pattern or arrangement of smaller areas contrasting essentially with one another. The whole ensemble or combination prevails over an area which, again, may be demarcated by clear boundaries or sharp transitions. We may perhaps call the first category a *simple landscape type* and the second, a *complex* or *composite landscape type*. These definitions in rather abstract terms may perhaps seem elusive at the moment ; their full significance will perhaps become more apparent when we turn again, shortly, to the map of Sudan. Meanwhile, a homely analogy may be helpful ; the difference between the simple and the complex types may be likened to that between lean beef and brawn, or between gammon and streaky bacon. Thirdly, not all the earth's surface may be thus described and demarcated ; the elements of landscape may vary in space in a somewhat incoherent manner, so that except for quite small areas, no uniformity or homogeneity may be apparent when they are viewed together. There is a natural landscape ; but no landscape types ; and attempts to discern and map such types meet with negation. Geographical study must resort to other methods of analysis.

The three types of area may be ascertained by map synthesis, which has been undertaken for Sudan, with the results seen in Fig. 5. It will be readily perceived, that this map has been constructed by superimposing the four maps showing separate elements of the natural landscape, and devising appropriate symbols to indicate the degree to which the boundaries of landscape elements coincide ; distinguishing also those boundaries which are clear-cut from those which are transitional.

The most clear and persistent of all the natural landscape boundaries separates the Clay Plain from the Ironstone Plateau. The fourfold boundary is visible for at least 600 miles. Southwards, however, the combination of elements present in the Sudan changes as Deciduous Woodland Savanna merges into Tropical Rain Forest : a change visible in the Yei-Yambio area. The Ironstone Plateau may however be deemed the first example of a simple landscape type. The second corresponds with the Sand (*Qoz*) not only a highly distinctive landscape type, but provided by nature with a well-marked boundary to the east and south-east, though with but a transition to the north. On a smaller scale is the third, formed by the volcanic uplands of the Jebel Marra and J. Gurgei characterized by rugged volcanic relief, montane climate, perennial streams and montane vegetation (26).

Four examples of composite or complex landscape types may be discerned. The first is the southern Clay Plain, composed of permanent marshes (mainly along

the perennial rivers), extensive areas of annually inundated clay plain, and the more restricted areas of "high" land, evincing soil and vegetation differences correlating with the almost imperceptible though significant relief, and somewhat greater

FIGURE 5

hydrological contrasts. This part of the Clay Plain marches with the Ironstone Plateau along the boundary already described, while northwards it meets the Sands and the Nuba Mountains type. East of the White Nile, it is not clearly demarcated from the northern Clay Plain, which itself is the second such type, characterized by small rocky *inselberge*, fringing pediments and extensive intervening clay plain. Its

western boundary is formed by the Dunes (*Qoz*), and the eastern, formed by the foothills of the Ethiopian uplands, is equally well-defined. The north, however, offers but a transition to semi-desert. The same elements of landscape recur in the Nuba Mountains type (the third composite type), where, however, the granite uplands are much larger, and a vegetation catena much more apparent. Fourth, to the west, is the central and western Darfur plateau, a savanna-mantled expanse composed of metamorphic and crystalline rocks, traversed by the radiating main valleys previously described, and revealing distinctive soils and vegetation.

In the far north-west is the Desert ; a simple type, but owing its simplicity to the fact that it is really composed of one element only : relief ; the other elements being absent. Demarcation of the desert is difficult. It will be observed that the lines marking the approximate beginnings of soils, vegetation and hydrological characteristics, though trending in the same direction, are not coincident. Clearly, there is a zone in which progressive change in the elements precludes identification of a type. It is perhaps tempting to conceive of a zone which may perhaps be called semi-desert, transitional between the desert and the three landscape regions farther south ; but on reflection it must be evident that it is a contradiction in terms to call a continuous transition a type. A type must possess a degree of uniformity and homogeneity. We may, however, conclude that Sudan does possess four simple natural landscape types (including the Desert) ; and four composite or complex types, extending over the greater part of the country.

3

In Sudan, the human elements of the landscape result mainly from pastoral and agricultural activities. Degradation of natural vegetation from grazing, grass-firing, firewood-cutting and shifting cultivation is widespread, and is accompanied by village settlement of recognizably distinct types. In the north, the utilization of ground water from rivers, wells and reservoirs contributes essentially to the pattern of the resultant humanized landscape. Types of land-use having villages and wells as focal points may be discerned.

Now the larger social units of Sudan are tribes, of very variable size, which may be classified according to their economies. For example it is customary to group the pastoral tribes into three divisions : first, the camel-owners of the north ; secondly, the mainly Arab cattle-owning tribes of the centre ; thirdly, the Nilotic cattle-owners and cultivators of the south. Likewise, there are evident fundamental contrasts between the agricultural economies practised by tribes of the Nile valley below Khartoum, those of the Sands (*Qoz*), of the Nuba mountains area, of the western Darfur valleys and of the Ironstone plateau in Equatoria and Bahr el Ghazal.

Furthermore, tribes parcel the land between themselves. Each Arab tribe has its "dar" or tribal territory, and is aware of its characteristics, its features and its limits. Non-Arab tribes, equally, lay claim to defined tracts. Especially among the nomadic pastoralists, conflicting claims are not uncommon ; but the progressive establishment of governmental authority since 1900 has been followed by many intertribal settlements, delimitation (in some places demarcation) of boundaries, and agreements for joint use of some areas. It has thus become possible to prepare a map showing the tribes of the country, and the limits of tribal territories (29) except for a few areas characterized by abnormal fragmentation or admixture.

Thus, tribal areas may be correlated with natural landscape types, and a map (Fig. 6) has been prepared to reveal the results of such correlation. The representation of tribal areas on this map has, however, been adapted from the Sudan Government maps in a two-fold manner : first, by delineating more completely the extent

FIGURE 6

of uninhabited areas, i.e. areas without agricultural settlements and also unused for grazing by nomadic pastoral tribes ; secondly, by grouping smaller tribes with larger, where similar economies are practised within natural landscape types. Thereby, some tribal boundaries which are not significant for the purpose of the correlation are eliminated.

In applying this procedure, it is interesting to note the extent to which the division of the country into provinces and districts conforms to tribal boundaries. It has often been remarked that political boundaries in Africa, partly as a consequence of imperfect ethnographical knowledge at the time of partition among European powers, often transgress tribal territories; and the frontiers of Sudan are no exception, for they divide the Masalit, the Zaghawa, the Azande, the Toposa, the Beja and several smaller tribes along the Ethiopian border (35). But within the country, administrative boundaries have been deliberately, though not wholly, adjusted to tribal areas. Thus, the three southern provinces of Upper Nile, Equatoria and Bahr el Ghazal have been delimited so that all Arab and Nuba peoples are excluded, while all Nilotic have been included. The boundary between eastern Equatoria and Upper Nile has been drawn (through an uninhabited area) so that Murle and Dinka are within the latter, while Latuka, Lafit and Toposa are in the former. In the north, the southern section of the Kordofan-Darfur boundary corresponds with the march between the Humr and Rizeigat. The western boundary of Kassala, north of latitude 16° N., separates the grazing lands of Beja from those of Arab camel-owning tribes. In Fig. 6, therefore, tribal boundaries in inhabited areas corresponding with administrative boundaries are shown distinctively.

It should further be understood that uninhabited areas generally serve as frontier zones between tribal areas. Such "no man's lands" are recognized by the adjacent tribes, who are content to leave them unoccupied, because they are unproductive by the techniques of the economies practised. Such vacua are, however, anathema to the modern administrator, to whom it is axiomatic that no area is unadministered, even the desert. Province or district boundaries therefore frequently bisect uninhabited areas, usually by a straight line; and have also been shown distinctively on Fig. 6. Other boundaries have been delimited in areas which are used only seasonally by nomadic tribes.

Thus compiled, this map represents the relationship between tribal areas and natural landscape types, apart from the joint use in the central zone of land by nomadic tribes and sedentary tribes. To attempt to represent such dual use of areas on fig. 6 would be confusing; and a separate map (Fig. 7) has been prepared to depict the limits of the areas traversed by the three main categories of pastoral tribes. Comparison of Fig. 7 with Fig. 6 shows the extent to which pastoral tribes supplement the grazing available within their tribal territories proper by migration at certain seasons into the lands of neighbouring sedentary tribes.

When the divisions shown on Fig. 6 are considered together, and with respect to the relationship between the human and the natural elements of the landscape, a basis of classification becomes apparent, which has been incorporated in the tables which follow.

A proportion of tribes (in Class I) have become established within the Dunes (*Qoz*) and the Ironstone Plateau. They have evolved wholly or partly agricultural economies which are adjusted to the resources of their territories. A much larger proportion of tribes (in Classes II to IV) require the resources of complementary adjacent landscape types, or of the separate components of composite landscape types. The manner of utilizing such complementary areas is noted in the tables. Camel-owning tribes (except the Beja), occupying the transition to Desert (Class III) require not only the range of resource-difference inherent in the transition, but also make use of adjoining landscape types. Their territories proper lie near the northern limit of summer rainfall. During the dry season they migrate southwards into the Central Darfur plateau and the Dunes (*Qoz*), apart from some sections

which first migrate northwards into the desert (*gizu*) grazing along the Wadi Howar, which they use in common (Fig. 7).

Because of the advantages to be derived by utilizing complementary areas,

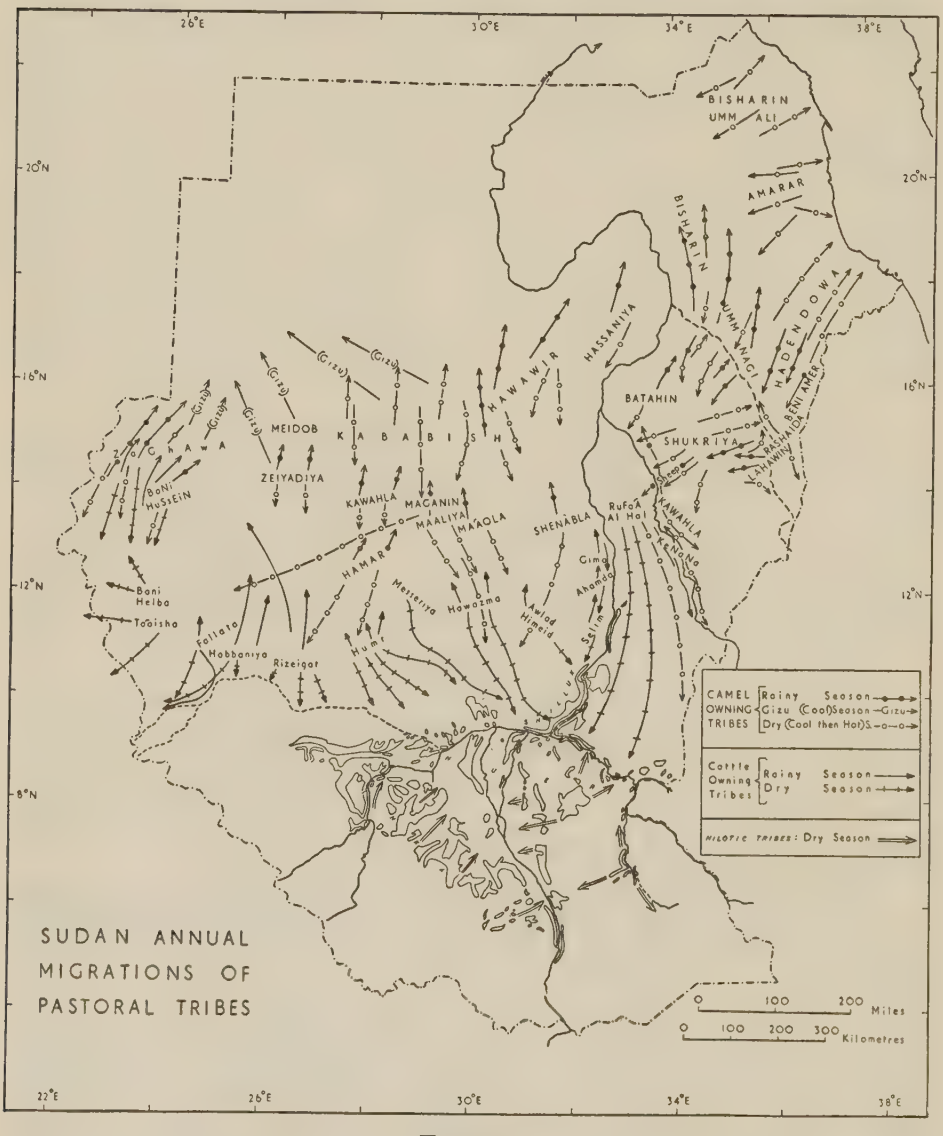

FIGURE 7

correspondence of tribal areas with landscape types occurs mainly when the latter are composite, and thus provide the required diversity internally. But many tribes obtain the resources they require by occupying areas straddling the boundaries between adjoining landscape types. (Class IV).

TRIBAL AREAS AND LANDSCAPE TYPES

I. WHOLLY OR ALMOST WHOLLY WITHIN SIMPLE LANDSCAPE TYPES

Group	Landscape Type	Tribe(s)	Economy
A	Stabilized Dunes	A1 Berti (southern portion)	Scattered cultivation in *Qoz* of eastern Darfur.
		A2 Mainly sedentary, mainly Arab tribes of central Kordofan (Gawama'a, Hamid Baza'a, with some small Nuba tribes, and the more southern Arab camel-owning tribes (Hamar, Bedeiriya, Shenabla).	Originally nomadic, these tribes have become mainly sedentary near water sources; and their cultivated areas have expanded during the Condominium. The camel-owning tribes also have settled elements.
B	Ironstone Plateau	B1 Fertit, including Kreich, Ferogi and Bor.	Sparse and scattered small groups practising shifting cultivation.
		B2 Jur, Bongo.	As B1
		B3 Moru, Nyangwara, Fajelu and smaller tribes.	As B1
		B4 Azande	Shifting cultivation. Originally tended to settle near valley bottoms; but were resettled near roads following watersheds about 1920 to control sleeping sickness. Further resettlement took place from 1946 to promote cotton growing.
		B5 Kaliko, Kakwa, Kuku and smaller tribes.	As B4 in woodland savanna recently derived from rain forest.
		B6 Opari	As B5
		B7 Didinga	Occupy an upland, and also cultivate piedmont plains. (Alternatively, a small composite type area).
C	Ethiopian Uplands	C1 Gellaba, Tiye, Kichepu, etc.	Small cultivating groups, extending into Ethiopia.
D	Jebel Marra	D1 Mountain Fur	Sedentary cultivators, who terrace mountain slopes and make small irrigated gardens close to perennial streams.

II. WITHIN COMPOSITE LANDSCAPE TYPES

A	Central Darfur Plateau	A1 Masalit	Agriculture, mainly on terraces of Wadi Kaja and tributaries.
		A2 Western Fur	Agriculture, on silt terraces of upper W. Azum and tributaries.

TRIBAL AREAS AND LANDSCAPE TYPES—CONTINUED

II. WITHIN COMPOSITE LANDSCAPE TYPES—CONTINUED

Group	Landscape Type	Tribe(s)	Economy
A	Central Darfur Plateau	A3 South Eastern Fur	Agriculture, mainly on piedmont silt plains.
		A4 Beni Helba (Cattle-owning pastoralists); Mesiriya, southern Fur, Dagu.	Beni Helba stay for much of year along wadis draining south from J. Marra; but in summer move to W. Azum; cultivators live mainly where suitable soils occur near main watercourses draining south-eastwards from J. Marra.
B	Nuba Mountains	B1 Diverse Nuba tribes, with Arab Hawazma, Awlad Himeid, and parts of Kenana, Dubab and Kawahla.	Nuba tribes originally engaged in terraces cultivated on rocky hills, keeping some stock. Now also cultivate piedmont gravel, silt and clay areas. Arab tribes still mainly cattle-herders, moving south-eastwards in dry season.
C	Northern Clay Plain	C1 Shukriya	Camel-owning nomads, also rearing large flocks of sheep. During dry season depend upon wells (now augmented by bore holes and *hafirs*), the Blue Nile and the Atbara river.
		C2 Blue Nile — Gedaref Tribal Mosaic, Ga'aliyin, Kenana, Kawahla, Halawiyin, Rufa'a with Fung, Fellata and mixed tribes. Many tribal groups are affiliated to tribes with main *dars* elsewhere.	Main areas of settlement along Blue and White Niles, and tribal areas much influenced by need to have land along these rivers. Other areas of older settlement near *inselberge* of Gezira and east of the Blue Nile towards Gedaref. Much recent immigration; and economy much influenced by large gravity and pump schemes, as well as *hafirs* and mechanized farming (30). But Rufa'a al-Hoi and Kenana still nomadic pastroalists.
		C3 Ahamda	A cattle-owning pastoral tribe inhabiting a *dar* west of the White Nile in which lines of sand dunes, running north-south, cross the clay surface.

TRIBAL AREAS AND LANDSCAPE TYPES—CONTINUED

II. WITHIN COMPOSITE LANDSCAPE TYPES—CONTINUED

Group	Landscape Type	Tribe(s)	Economy
D	Southern Clay Plain	D1 Nuer	A Nilotic cattle-owning pastoral tribe, divided into many sub-tribes, occupying a zone stretching from the middle Sobat to the Bahr el Ghazal. During the rains stay in their villages on "high", i.e. unflooded, land, and engage in limited cultivation. In dry season migrate with cattle to vicinity of permanent rivers.
		D2 Southern Dinka	Rainy season settlements on sandy ridges east of Bahr el Jebel; move westwards to this river in dry season.
		D3 Murle	Live close to upper Pibor and its tributaries. Economy similar to D1 and D2.
		D4 Anuak	Occupy both sides of Akobo valley and thus partly in Ethiopia.

III. IN THE TRANSITION TO DESERT

A	The Semi-Desert Transition	A1 Zaghawa, Meidob, northern Berti, northern Gimr	Z. are non-Arab nomadic camel- and cattle-herders, but also are cultivators to a certain extent. Main grazing areas in north-western central Darfur; they migrate southwards to W. Azum in dry season, unless *gizu* available. M. remain all year near Meidob hills, apart from *gizu*. B. are cultivators at the edge of the N.W. lobe of the stabilized dunes: Gimr adjoin Masalit.
		A2 Kabbabish, Hawawir, Hassaniya, Zeiyadiya, Kawahla, Maganin, Ma'aliya, Ma'aqla.	Nomadic Arab camel-herders; main grazing areas in northern Kordofan in which tend to move North in rains and South in dry season. Participate in migration to *gizu* grazing when available.

TRIBAL AREAS AND LANDSCAPE TYPES—CONTINUED

III. IN THE TRANSITION TO DESERT—CONTINUED

Group	Landscape Type	Tribe(s)	Economy
A	The Semi-Desert Transition	A3 Beja	Nomadic non-Arab camel-herders, occupying the Red Sea hills and coastal plain. Southern groups migrate into Eritrea.
B	The Exotic Nile valley between Khartoum and Wadi Halfa	B1 Rubatab, Ga'alayin, Manasir and part Shaiqiya	Sedentary cultivators, using the *saqiya* or Persian water-wheel to irrigate grain, forage crops, pulses and date-palms. Some larger units watered by pumps.
		B2 Shaiqiya, Nubiyin	As B1, between the 4th and 3rd Cataracts.
		B3 Nubiyin	As B1, between the 2nd Cataract and the Egyptian frontier.

IV. EXTENDING INTO GENERALLY COMPLEMENTARY LANDSCAPE TYPES

A	Central Darfur Plateau and Dunes (*Qoz*)	A1 Fur and Berti of Upper W. Golo basin	Cultivators of terraces and sand, often needing to migrate during dry season when local wells fail.
		A2 Bergid	Located mainly in vicinity of lower W. El Ku and tributaries. Migrate nearer J. Marra when water shortage occurs.
		A3 Ta'aisha	Cattle-owning nomads, whose *dar* is on plateau in vicinity of Rahad el Berdi. Use north fringe of Qoz Dango in rains; migrate west and north-west during summer.
B	Dunes (*Qoz*) and Ironstone Plateau	B1 Habbaniya, Fallata	Nomadic cattle-herders, spending most of the year on the Baggara catena part of the Dunes (*Qoz*); but moving north at height of rainy season and south towards headwaters of Bahr el Arab during dry season.
C	Dunes (*Qoz*) and Southern Clay Plain	C1 Rizeigat	As B1; migrating towards middle Bahr el Arab during dry season.

TRIBAL AREAS AND LANDSCAPE TYPES—CONTINUED

IV. EXTENDING INTO GENERALLY COMPLEMENTARY LANDSCAPE TYPES—CONTINUED

Group	Landscape Type	Tribe(s)	Economy
C	Dunes (*Qoz*) and Southern Clay Plain	C2 Humr	Cattle - herders, occupying part of the *raqaba* catena at intermediate seasons, migrating northwards to the true *Qoz* during the rains, and southwards to the fringe of the Clay Plain (Raqaba ez-Zarqa) during the dry season (31).
D	Southern Margin of Nuba Mountains and Southern Clay Plain	D1 Western Dinka (mainly Ruweng)	As IID
E	Northern and Southern Clay Plains	E1 Shilluk	Extension into Northern Clay Plain fortuitous. Inhabited and cultivated areas adjoin marsh pastures close to White Nile.
		E2 Eastern Dinka	As F1.
F	Ethiopian Upland and Northern Clay Plain	F1 Southern Fung Tribes (Ingessana, Berta, Barun Uduk)	Non-Arab tribes, practising a diversity of cultivation, including some shifting cultivation (32).
G	Ironstone Plateau and Southern Clay Plain	G1 Western Dinka	As IID, utilizing the edge of the Ironstone Plateau for their villages and cultivation; but have some settled areas within the Clay Plain on "high" land.
		G2 Mandari	As IV G1
		G3 Bari	Cultivate the Bahr el-Jebel floodplain below the Fula rapids; also occupy adjoining areas of Ironstone Plateau.
		G4 Latuka, Dongotona, Lafit	Cultivate piedmont "aprons", also own cattle and utilize parts of the Clay Plain.
		G5 Taposa	Nomadic cattle-herders, migrating at times into Kenya.
H	Dunes (*Qoz*) and Northern Clay Plain	H1 Riverine Hassaniya	A group of Hassaniya who have succeeded in straddling the White Nile. Now mainly settled.

Throughout the foregoing, emphasis has been given to aspects which characterize each unit as a humanized landscape type.

Implicit in the preceding reasoning is a conclusion or principle which is perhaps of universal validity, viz. that the unit for the purpose of studying the humanized landscape is smaller than that for the natural landscape (36). Four or five

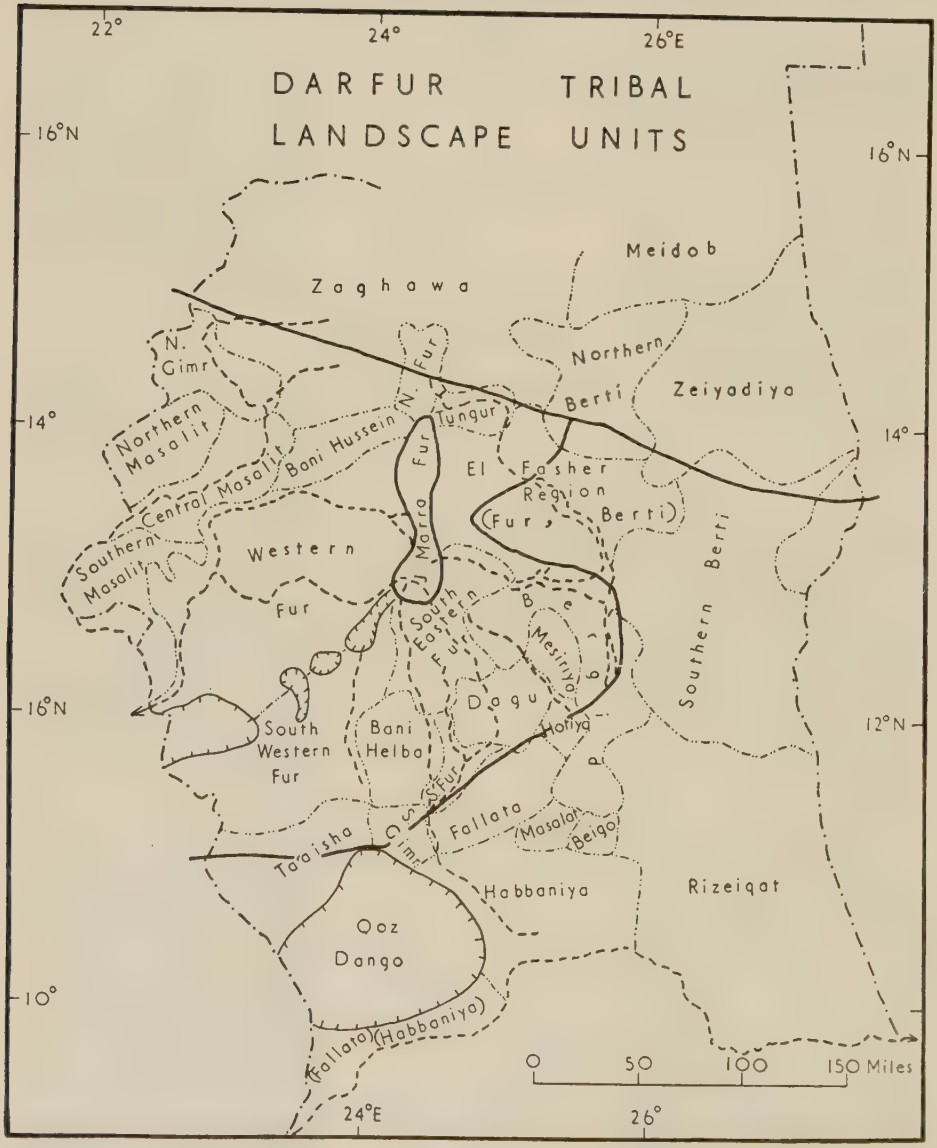

FIGURE 8

natural landscape types extend over the greater part of the country. But the number of tribal areas is greater by tenfold. This contrast arises partly from the stage of social development obtaining among the greater part of the population of Sudan.

Not that there is wanting a range of size between Dar Kabbabish, occupying the whole breadth of northern Kordofan and the restricted territories of smaller southern tribes, e.g. the Jur. But the normal tribal area is the comparatively small tract within which the population can be governed by the recognized chief, chiefs or leaders, and which suffices for the pursuit of the established economic activities.

It may perhaps be contended that larger units can be discerned and analysed, e.g. the southern Clay Plain and its Nilotic inhabitants, which practise similar economies, despite their linguistic and other ethnographic differences. But this is to view the matter too exclusively from the standpoint of the academic geographer. When the country is considered by its inhabitants, the real units are conceived as the tribal *dars*, or lands which exist as geographical entities in the minds of tribesmen, and can be defined and described to the visiting investigator. If geography is ultimately to have beneficial applications, should it not be of the people, in the sense that it corresponds with the geographical notions of the ordinary man ?

To illustrate this principle, an attempt has been made to divide Darfur into such humanized landscape units (Fig. 8). This scheme has been based upon the Tribal Areas map (29) and Fig. 6 ; but the boundaries between tribes or tribal groups have been adjusted to accord more fully with the facts of configuration and population distribution, and some of the larger units of Fig. 6 have been subdivided. The descriptive notes below supplement those in the foregoing table.

Zaghawa. May be characterized as mainly Basement Complex plateau, of diversified relief, with a network of seasonal watercourses and patches of clay and sand. Nomadism is practised, with subsidiary cultivation from seasonally-occupied villages. (III A 1).

Meidob. Consists of a core (the Meidob hills), from which watercourses radiate across piedmont plateaux. A subdivision of III A 1.

Northern Gimr. Hilly, drained by tributaries of the W. Kaja, containing many areas of seasonal settlement and cultivation, often in piedmont situations. A subdivision of III A 1.

Northern Masalit. Similar to Northern Gimr ; but with greater population and degree of permanence. A subdivision of II A 1.

Central Masalit. The main valley of the W. Kaja above El Geneina, containing extensive cultivated alluvial spreads and dune areas. Part of II A 1.

Dar Bani Husein. Rather dry Basement Complex plateau, with some areas suitable for rain cultivation, and occupied by the Bani Husein for much of the year, though in the summer they migrate to the W. Azum. (III A 1 and II A 2).

Northern Fur. Formed by the northern extremity of the J. Marra range, west of Kutum, containing many villages in piedmont situations, and comparable with Northern Masalit.

Tungur. Comprises the upper basin of the W. Golo, in the vicinity of Kutum, occupied by a settled population, as well as, at times, by Zaghawa and the northern Rizeiqat. The latter are Arab camel herders without a *dar*. (III A 1).

Northern Berti. Comprises the extreme north-western margin of the stabilized Dunes. The population is agricultural, but migratory (towards the south-west) during the dry season. (III A 1).

Dar Zeiyadiya. Is essentially the northwest lobe of the Stabilized Dunes, and has very poor water supplies. The Zeiyadiya therefore resort to wells on the margins of their *dar*, especially near Meidob, Mellit and Umm Keddada. (III A 2).

Southern Masalit. Is largely hilly, wooded and uninhabited Basement Complex plateau; with some settlement and cultivation in main valleys. A subdivision of II A 1.

Western Fur. See II A 2. Villages are located on valley sides above silt terraces. Excellent water supplies in shallow wells during dry season attract many nomadic pastoralists whose activities are complementary to those of the sedentary population.

Jebel Marra Fur. See I D 1. Settlements in villages and dispersed homesteads close to perennial streams.

El Fasher Region. (Fur, Berti). Is the basin of the middle W. Golo, with a settled population cultivating dunes; alluvial terraces and silt or clay plains. Especially from the east, there is migration during the dry season towards the permanent well fields; leaving some villages much reduced in population at that period. (IV A 1).

Southern Berti. Sparse settlement in western part of central zone of stabilized dunes, with limited water supplies, whence westward migrations with cattle occur during the dry season. Some use is made of the grazing resources by the Habbaniya and Rizeiqat during the rainy season. (I A 1).

Bergid. Village cultivators established near the W. Abu Hamra and the lower W. Golo. Water supplies often poor; and partial migration with cattle during dry season. (IV A 2).

Dar Mesiriya. A small tribal area on Basement Complex plateau, flanking the W. Amer, and a subdivision of II A 4.

Southeastern Fur. II A 2.

Dagu. Villages and cultivation areas among granite hills and on thin sands at edge of *qoz*. Some perennial water supplies at foot of hills. A subdivision of II A 4.

Southwestern Fur. Rather densely wooded and rugged Basement Complex plateau, with sparse scattered villages and cultivation in some valleys. A subdivision of II A 2.

Dar Ta'aisha. IV A 3.

Southern Gimr, Southern Fur, Hotiya. Small tribal areas at edge of stabilized sands, with cultivation on sand and silt. Subdivisions of IV B 1.

Fallata. Cattle-herders occupying small area of Baggara catena, and migrating to grazing on southern margin of the Qoz Dango during the dry season. (IV B 1).

Masalit, Beijo. Small cultivating tribes in Baggara catena.

Dar Habbaniya. A large area of Baggara catena, sufficing for requirements of cattle-rearing, except at the height of the rainy season, when herds are moved northwards onto the Dunes proper, and towards the end of the dry season, when they move southwestwards along the headwaters of the Bahr el Arab to Ironstone Plateau at the edge of the Qoz Dango. (IV B 1).

Dar Rizeiqat. IV C 1.

The principle that the real units of the humanized landscape are small is also confirmed from France, where the pioneers of modern studies in regional human geography found ready to hand the peasants' traditional division of the country into *pays*, and took pleasure in showing that scientific study justified the popular geography. It was realized that the French word *pays* is derived from the mediaeval Latin word *pagus*, which signifies nothing more or less than a tribal *dar*. In the early mediaeval period, these *pagi* were often feudal administrative units, such as counties, or ecclesiastical units, such as bishoprics or archdeaconries. The comparison with Sudan today hardly needs to be pointed out. Several subsequent reforms of administrative divisions for civil purposes have divorced the *pays* almost wholly from the modern division of France into departments and their subdivision into cantons ; though correspondence is still to be observed in a number of instances with the more enduring ecclesiastical territorial divisions (33). But the fact that the popularly-recognized geographical units of a European country are small, and have in some instances their origin in tribal units provides cogent support for the argument in this address. For even in Europe, despite the protracted further development of economy, society and landscape, some geographical units of tribal society are still real.

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[The maps illustrating this article were drawn by Osman Satti, Technician to the Department of Geography, University of Khartoum.]

A RAINFALL MAP OF THE SUDAN GEZIRA

by

JOHN R. RANDELL

Although the Gezira has the densest concentration of rain-gauges in the Sudan no attempt has been made until now to use the mass of data available for drawing a rainfall map of the area. Altogether there are about 200 officially recognized rainfall stations within the Gezira Scheme most of which have records spanning a period of twenty years or more. In addition to these are some fourteen older stations on the Blue and White Niles and one in the middle of the Gezira, the records of which go back for more than thirty years. Outside the area data are scarcer but long period observations are available for half a dozen localities on either side of the Gezira.

Rainfall maps of the Sudan such as A. W. Ireland's (1954), that produced by the Sudan Meteorological Service (1957) and the maps of rainfall in the Nile Basin accompanying Hurst's and Black's work (1943 and 1950) are all drawn with an isohyetal interval of 100 millimetres or more ; and, being concerned with the country as a whole, necessarily conceal details in a comparatively small area such as the Gezira.

The accompanying map (Fig. 1) was drawn after plotting average values for 107 stations in the irrigated area, means on both rivers and, in addition, all available data relating to surrounding parts to a distance of approximately 100 miles east and west of the Blue and White Niles respectively.

For purposes of plotting, the stations were grouped into four orders corresponding to the periods of observations :

TABLE 1

Order	*Period*	*No. of Stations*
1	1921–1950 inclusive (30 years of observations)	16
2	1931–1950 inclusive (20 years of observations)	60
3	1925/26–1950 inclusive (26 or 25 years of observations) ..	20
4	Observations of between 20 and 30 years' duration (other than Order 3 above)	27
	TOTAL	123

The isohyets labelled 150–550 millimetres (thirty year isohyets) were drawn mainly by reference to stations of Order 1. Since almost all of these stations are located outside the irrigated area the isohyets cannot be regarded as valid for the Gezira Scheme. Thus they are generalized isohyets and, as will be shown below, they do not reveal details of rainfall distribution within the Gezira which are of considerable interest from the viewpoint of agro-climatology.

Another comparable set of isohyets, those numbered 1–4, is derived from stations of Order 2. This is the most significant set in many respects since it is

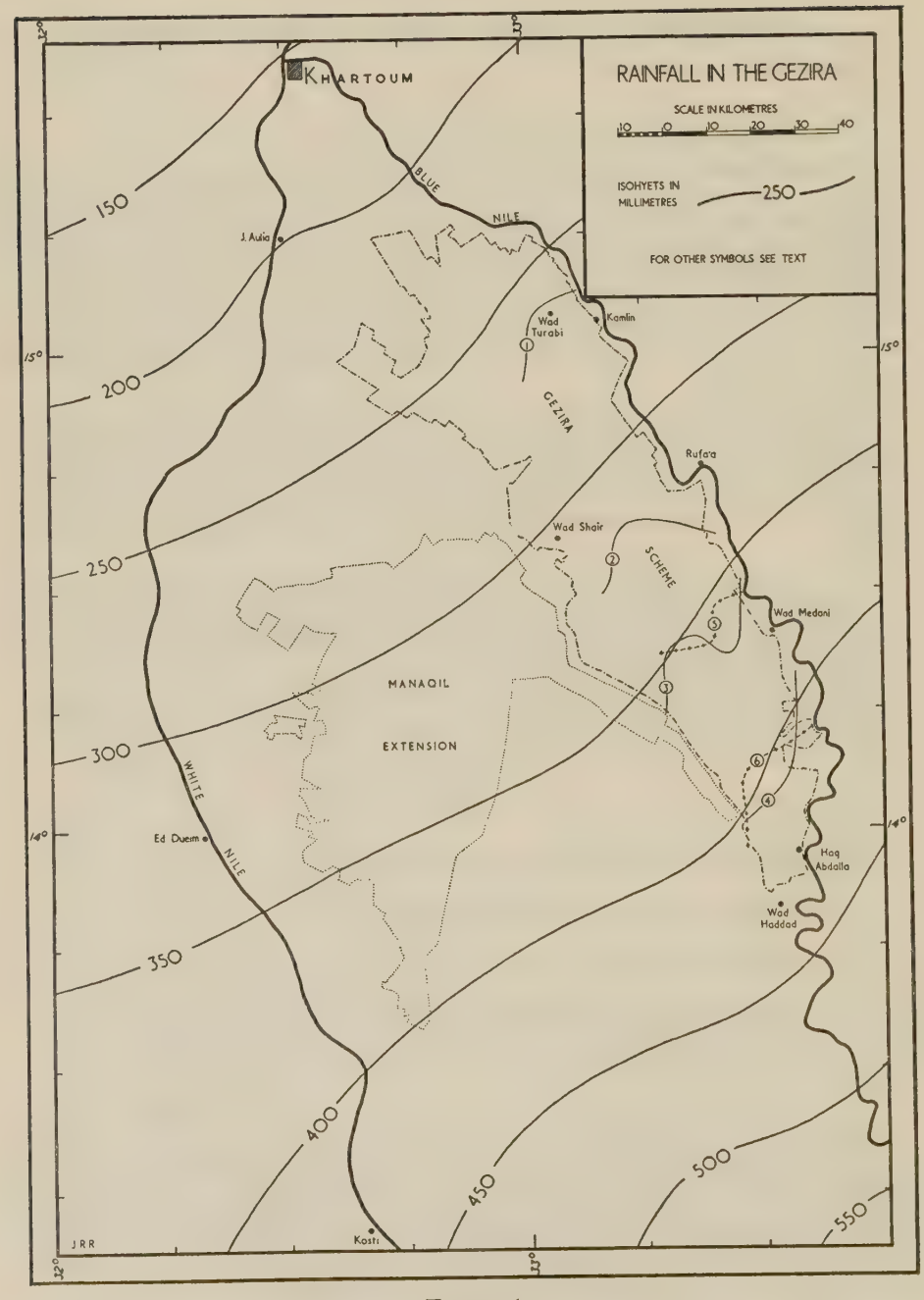
RAINFALL IN THE GEZIRA
SCALE IN KILOMETRES
10 0 10 20 30 40
ISOHYETS IN MILLIMETRES
250
FOR OTHER SYMBOLS SEE TEXT
KHARTOUM
BLUE NILE
J. Auliá
Wad Turabi
Kamlin
GEZIRA
Rufa'a
Wad Shair
SCHEME
Wad Medani
MANAQIL
EXTENSION
WHITE NILE
Ed Dueim
Haq Abdalla
Wad Haddad
Kosti
JRR
150
200
250
300
350
400
450
500
550
13°
14°

FIGURE 1

based on the largest number of stations, all of which are located within the Gezira Scheme. It will be seen that these isohyets exhibit a north-south trend which is particularly marked in the west.

The same trend is emphasized by isohyet No. 6 whch, like No. 5, is based on stations of Order 3.

For each of the six isohyets the actual value corresponds to that of the nearest generalized isohyet. Thus No. 1 equals 250 millimetres ; No. 2, 300 millimetres, etc.

After discarding some of the stations of Order 4, the records of which displayed exceptional divergence from normal values, it was possible to use this group as a basis for checking all three sets of isohyets. Only minor changes in the original plotting were introduced, since in most instances there was a reasonable degree of correspondence.

The configuration of isohyets numbered 1–6 is a clear indication that the generalized pattern of the thirty-year isohyets is unacceptable for the irrigated Gezira. It strongly suggests that the more humid environment of the Gezira Scheme, as compared to the semi-arid surroundings, exerts an influence on the rainfall. Indeed this is not surprising when the extent of the difference between the two landscapes is fully appreciated.

Authorities are agreed that most of the rainfall in this part of the Sudan comes in the form of thunderstorms and that during the rainy season the southwest monsoon dominates the surface circulation.[1] This being the case the effects of the Gezira Scheme on rainfall should be identifiable as the mT air enters the irrigated area from the southwest. As mentioned above, the most striking feature of the twenty-year set of isohyets is the north-south trend in the west, indicating an increase in rainfall precisely where we would expect to find the most pronounced effects. (In the centre and north the scheme has been extended westwards in recent years.)

These effects are related to the so-called "trigger action" which is necessary to initiate convection even in unstable airmasses. As defined by Garbell (1947), either surface heating, surface evaporation, lifting by frontal action, orographic lifting or convergence could constitute a trigger action. Of these, surface evaporation is the most relevant in the present instance. H. von Ficker (1931) cites this process as the principal one in the formation of non-frontal thunderstorms over flat, continental terrain. He shows how cool air, drifting outward from above small bodies of water, swamps, woods and other areas kept cool by evaporation, pushes the surrounding warm air upward thus supplying the trigger action necessary to produce thunderstorms. To such areas he applies the term "thunderstorm hearth".

Byers (Byers and Braham 1947) places more emphasis on the relief of underlying terrain and thus favours orographic lifting as the trigger action in his exhaustive study of Ohio thunderstorms. In discussing the popular notion that thunderstorms follow rivers and that the moisture provided by the stream favours propagation along the watercourse the author draws attention to the frequent occurrence of dissected terrain and river bluffs along the courses of rivers.

[1] There is some difference of opinion as to the origin of this air. El Fandy believes it to be composed of two streams, one from the Indian Ocean and the other from the South Atlantic. Solot excludes South Atlantic air altogether from this part of the Sudan, identifying the mT airmass as originating over the South Indian Ocean.

"Scientific studies indicate that where thunderstorms propagate along rivers, conditions of the terrain rather than the presence of the water are the factors which are favourable for new growth". Orographic lifting, then, is likely to be a primary factor responsible for the northward deflection of isohyets 3 and 4 in the vicinity of Wad Medani. Here the Blue Nile follows a course which is closer to the direction in which surface winds are blowing and the meandering course of the river places much dissected terrain across the path of the airstream. Southerly winds are, in fact, frequent in July and August. (Sutton 1931).

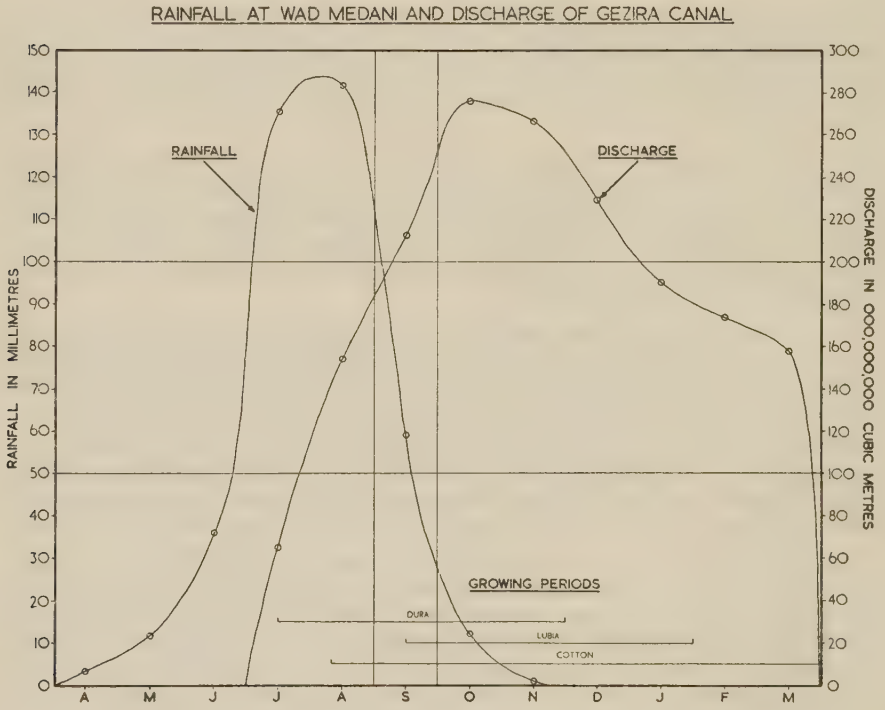

FIGURE 2

So far the discussion has been confined to mean annual values of rainfall and local divergence from the generalized annual isohyets. For the purpose of gauging the effects of the Gezira Scheme it is more profitable, in some respects, to study monthly values since one would expect the rainfall to be influenced most noticeably during those months when irrigation is at a maximum. For obvious reasons the rainy season does not exactly coincide with the period of irrigation but towards the end of the rains there is overlapping. This relationship will be clear from the diagram (Fig. 2) where the rainfall régime at Wad Medani is plotted against canal head discharge of the main Gezira canal at Sennar. The chances of irrigation affecting the rainfall are seen to be best in September when the volume of water used and the extent of irrigated land, as indicated by the growing periods, are approaching maximum values and rain is still falling in appreciable amounts. Irrigation effects, however, can be expected during the three months July to September inclusive and

will be revealed by comparing the percentage of yearly rainfall recorded during these three months at stations inside and outside the irrigated area. Apart from any effects brought about by irrigation this percentage varies inversely with total rainfall as the length of the rainy season increases southward. For this reason it is important to maintain parity of total rainfall if a valid comparison is to be made. In Table 2 it will be seen that the irrigated area records the higher total with an annual average of 355 millimetres against 353 millimetres for the unirrigated area; yet, over the twenty-year period 1928–47, the percentage falling during July–September is 1·7 per cent greater in the irrigated area. But if the decade 1938–47 is considered separately the difference increases to 3 per cent. It should be noted, in this connection, that between 1928 and 1938 the area of the Gezira Scheme expanded from 300,000 *feddans* to well over 800,000 *feddans* so that during the second decade the irrigated area was almost twice what it had been during the first.[1] (Tothill, 1948). Most of this expansion took place in what are now the northern and western parts of the scheme (Gaitskell, 1959) where are located the stations, Wad Turabi, Kamlin and Wad Shair, which reveal the greatest differences between the two decades. Only Jebel Aulia among the northern stations outside the Gezira Scheme shows a comparable difference, 2·86 per cent compared with 4·55 per cent at Wad Turabi, and it is not inconceivable that this is itself attributable to the proximity of the northernmost sections of the irrigated Gezira.

TABLE 2

PERCENTAGE OF RAINFALL IN JULY, AUGUST AND SEPTEMBER

Unirrigated Area				*Irrigated Area*			
Station	*Total R'fall 1928–47 (mm.)*	*% July–Sept. 1928–47*	*% July–Sept. 1938–47*	*Station*	*Total R'fall 1928–47 (mm.)*	*% July–Sept. 1928–47*	*% July–Sept. 1938–47*
J. Aulia ..	4142	82·09	84·95	Wad Turabi ..	5228	78·71	83·26
Bara	6136	83·14	82·78	Wad Shair ..	5603	83·29	85·03
Kassala ..	6524	82·23	81·74	Kamlin ..	5995	84·20	89·51
Ed Dueim ..	6935	79·68	78·82	Rufa'a	6378	82·93	83·31
Kosti ..	8391	72·64	73·67	Wad Medani ..	7820	80·14	78·64
Jebelein ..	8420	76·73	78·88	Hag Abdulla ..	9266	79·69	81·90
Er Rahad ..	8898	78·60	79·86	Wad Haddad ..	9447	78·23	80·34
Total ..	49446	555·11	560·70		49737	567·19	581·99
Average ..	353	79·3	80·1		355	81·0	83·1

[*Source :* H. E. Hurst and R. P. Black (1938, 1943 and 1950), *The Nile Basin*, Vol. VI and 1st and 2nd Supplement to Vol. VI, Ministry of Public Works, Physical Department, Cairo.

Note : The stations in the irrigated area include all for which long period monthly records are available.

Stations in the unirrigated area were selected on the basis of total rainfall for the period 1928–47 in order that parity be maintained between the two areas in this respect.

[1] A *feddan* equals 1.038 acres.

In an annual total of 355 millimetres a difference between irrigated and unirrigated areas of 1·7 per cent equals 6 millimetres which is barely sufficient to produce irregularities on an isohyetal map. Those observed when plotting the twenty-year isohyets were in the vicinity of 10–15 millimetres and closer to the 3 per cent (10·7 millimetres) of the second decade. The location of stations may account for the discrepancy, as published monthly rainfall records of long period observations are not available for localities on the western side of the scheme where the most notable irregularities were observed. Apart from this, it is unlikely that irrigation effects would be confined to the three months studied but would extend throughout the rainy season. The dense network of canals is used during the entire year to supply water for domestic purposes and along the banks of major canals a permanent canopy of vegetation has established itself so that evaporation and transpiration within the scheme is higher than elsewhere even when no water is being used for agriculture.

With the statistics that are available it is difficult to account conclusively for increased rainfall in terms of differences in temperature and humidity. Climatological stations are far fewer than rainfall stations in the Sudan and no complete records are published. Nevertheless, from the table below which is based on normal values, it does appear that irrigation brings about a lowering of minimum temperatures in July, August and September and increases humidity during the latter half of the period.

TABLE 3

MEANS OF TEMPERATURE AND HUMIDITY

	Temperature			
Station	*Mean Annual Temperature* (°C)	*Mean Minimum*		
		July	*August*	*September*
UNIRRIGATED AREA				
Kassala	26·8	23·3	22·4	22·9
Ed Dueim ..	26·3	23·5	22·8	22·8
Kosti	25·4	23·4	22·6	22·6
Total ..	78·5	70·2	67·8	68·3
Mean ..	26·2	23·4	22·6	22·8
IRRIGATED AREA				
Wad Turabi ..	26·6	23·9	23·0	22·9
Wad Medani ..	25·9	22·8	22·0	21·9
Hag Abdulla ..	25·9	22·6	21·6	21·7
Total ..	78·4	69·3	66·6	66·5
Mean ..	26·1	23·1	22·2	22·2

Table 3—Means of Temperature and Humidity—continued

	Humidity			
	Mean Annual Relative Humidity (%)	*Monthly Means*		
		July	*August*	*September*
UNIRRIGATED AREA				
Kassala	55	66	72	65
Ed Dueim ..	43	67	75	67
Kosti	46	71	79	73
Total ..	144	204	226	205
Mean ..	48	68	75	68
IRRIGATED AREA				
Wad Turabi ..	40	61	71	64
Wad Medani ..	43	66	77	70
Hag Abdulla ..	45	69	78	73
Total ..	128	196	226	207
Mean ..	43	65	75	69

[*Source :* Sudan Meteorological Service, *Climatological Normals* 1921–50, Khartoum, Sudan.]

There has not been a great deal of work done elsewhere on the climatic effects of irrigation schemes but some useful studies have, in recent years, been made by Soviet scientists among whom may be mentioned Dzerdzeevskii (1954), Archipova and Glebova (1952) and Gal'tsov (1953). Dzerdzeevskii compared conditions in the lowest atmospheric layer (up to 8 metres above the ground) over a dry steppe and a naturally moistened silt estuary with the object of determining the most advantageous size for irrigated areas. His investigations revealed important differences in the meteorological régimes depending on the micro-relief, the kind of soil and vegetation, and the length of the air flow over the dampened underlying surface. Archipova and Glebova established a difference of 9°–10° C. in air temperatures and 40–50 per cent relative humidity at a height of 20 centimetres above the ground as between irrigated and unirrigated parts of a field. Gal'tsov made a comparison of the micro-climates of irrigated cotton fields and adjoining desert lands near the lower reaches of the Amu Darya river in Kazakhstan. His studies showed the gradual transformation in terms of air temperature, air humidity and wind speed of air currents coming from the desert both during the day and at night. Of the three papers mentioned this is the most relevant because of the similarity of environmental conditions. None of them is concerned with rainfall but the differences which they reveal in the climatic conditions above irrigated and unirrigated lands are just those which von Ficker cites as providing the trigger action necessary to produce thunderstorms.

A NOTE ON THE MAP

The data on which the map is based are published by the Sudan Meteorological Service in tables of *Annual Rainfall Statistics* where, in addition to the annual total for the year, the mean annual rainfall and the number of years on which the mean is based are given. These figures were checked with an *Index List of Rain-gauge Stations* which shows the year in which observations commenced and the exact coordinates of each station.

The original plotting for the irrigated area was done at a scale of 1 : 250,000 on two maps, one each for stations of Orders 2 and 3. These sheets were combined with the thirty-year isohyets at 1 : 500,000 and the composite map reduced photographically.

ACKNOWLEDGMENT

For helpful criticism and assistance at various stages in the preparation of this paper the writer is indebted to Sayed Geili Mustafa of the Sudan Meteorological Service and Professor H. Törnebohm of the University of Khartoum.

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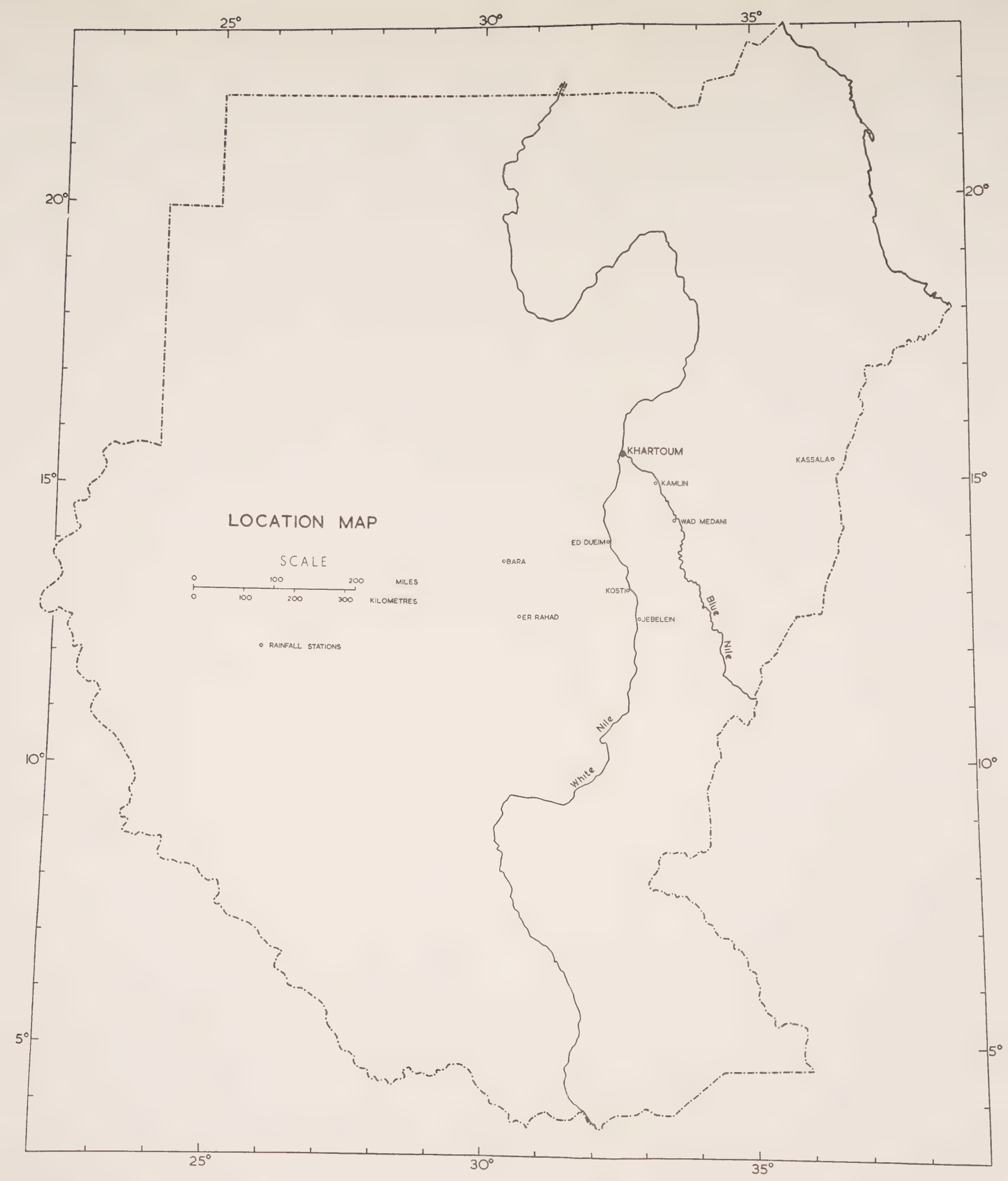

facing page 36

THE LIFE-STORY OF YUZBASHI 'ABDULLAH ADLAN

as told to

G. R. F. Bredin

FOREWORD

Towards the end of 1933 I was posted as Deputy Governor to El Obeid and shortly after the new year attended a levée at Province Headquarters. Among the crowd of sheikhs, uniformed officers and others awaiting their turn for presentation to the Governor I noticed an elderly Sudanese *yuzbashi*. He was remarkable both for his upright and soldierly carriage (in spite of his 80-odd years) and for the fact that the medals crowded on the chest of his tunic included the Gordon Star as well as those of the Nile campaigns while the latter bore the clasps of Toski, Firket, Atbara and Omdurman. It seemed to me that the chronicle of a man who had endured such a variety of military experience must be worth recording, and I approached him with the request that he should come to my house on a series of afternoons and give me an opportunity of writing at his dictation his personal reminiscences of the stirring events through which he had lived. He agreed and we embarked on our task forthwith.

The record which follows is the result of these sessions. It is written in the very words he used as nearly as I could reproduce them. I have made no additions or emendations, neither have I made any attempt to establish the historical accuracy of the narrative by comparing it with the official chronology of the events which he records or with the regimental histories of the regiments with which he served. It seemed to me best to reproduce the plain unvarnished narrative told as it was with astonishing vividness and with the unhesitating clarity of memory of early events so often granted to old age. Our joint efforts have, I hope, rescued from oblivion the story of a life of unusual interest covering a period in the history of the Sudan of which all too few such personal records survive.

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Yuzbashi 'Abdullah's Story

My father was the Sultan Adlan Badi of Jebel Gulli in the Fung where I was born. He could trace his ancestry back through twenty generations of the royal house of the Hill. My mother, was Fatma bint El Nazir Awdoon, the daughter of the Nazir of the Habbania tribe and came from Sherkeila. My brother Idris Adlan was the sixth ruler who had governed the Hill under the Turks and was the "Mek" at the time of the Mahdia.

When the Khedive Sa'id Pasha was in Khartoum on a visit to the Sudan in 1858 all the notables from far and wide were summoned to meet him. Amongst these was my father. The Khedive demanded that children from the families of three big sheiks should be sent in to join the army—one from among the sons of the Sultan of Darfur, one from Ibrahim Sabun the Dinka Chief of Kawa and the third from my father's household. At that time the Dinkas inhabited the banks of the White Nile as far north as Kawa near Dueim.

When he received these instructions my father passed word on to my uncle El Kashef Yusef, who was a "Sanjak" with the Turkish Army at Kassala and in whose charge I then was, that when I became twelve years of age (I was then eight) I should be enrolled in the Khedive's Army. In preparation for this career I was sent first to the local "Khalwa" to learn my letters under a Fiki named Abdullah Medani and, when I had been there for two years, my father told my uncle to put me into the school at Kassala which was in the charge of an Egyptian officer in the Bashi-Bazouks named Mohammed Zankaloni. This was the school to which the sons of all the local officers and notables used to go. It was a government school run by the Turks and as I was there by the Khedive's order I paid no fees. There I was soon joined by Adam Bosh son of Sultan Ahmed Bosh of El Fasher. He had done some schooling in Darfur and he and I worked together, but the Dinka representative who joined us later was no use at his books and just used to drill on the square with the soldiers.

Thus I spent three years. The Khedive Sa'id Pasha died and Isma'il Pasha took his place. He found among his records a note about us three children at Kassala and sent word to the Mudir (Abdel Razaq Pasha—who was afterwards killed with Hicks Pasha) to enlist us as soldiers and to send us to Egypt with the garrison of Kassala (four battalions) which was due for relief. Our uniform consisted of a short tunic buttoned up to the neck and made of white damour cloth, white trousers, boots and white spats and tarbooshes on our heads. Our pay was $7\frac{1}{2}$ piastres a month but, of course, our food and uniforms were provided free. The regular soldiers were given twenty piastres a month and were paid in coins which got the name "Abu Teir" as they had French eagles on them. The barracks were mud-brick buildings laid out in the shape of a square to form a fort. Each battalion drank from its own well. The married men lived in their own houses in the town. We called the barracks "Hara El Jehadia". The soldiers were all armed with muzzle-loading flint-locks and had not yet been issued with Remington rifles. The artillery consisted of small brass cannon which were carried on mules and iron ones which were carried on camels. They fired cannonballs made of cast iron.

We marched to Suakin, covering the distance in twenty-seven days ; and there Mumtaz Pasha, the Governor, sent for transports to take us to Egypt. Each battalion was put onto a separate transport. These were really men-of-war with an engine as well as sails. After five days at sea we reached Suez and from there were sent by rail to Cairo. Our regiments were taken to some barracks called "Tura El Kheit" and then we three boys were sent by the Miralai to the army headquarters where we were allocated to our several units. I was sent to the army music school, Adam Bosh to the infantry and the Dinka to the artillery. The last was found to be of no use as a soldier and after six months was sent back to the Sudan.

I spent nine years in the army music school.

At about this time an Austrian named Metzinger[1] Pasha who had visited Massawa wished to open up Eritrea and to add it to the Khedive's dominions and asked for an army with which to do this. The Khedive sent him a battalion and this landed and occupied a place called Senheit between Massawa and Agordat. A brother of Metzinger Pasha's then ventured further into Abyssinia but was killed by the Abyssinians who cut him into four pieces and hanged them onto separate trees. When news of this was brought to Metzinger Pasha he returned to his headquarters at Massawa and sent a despatch to Isma'il Pasha asking for more troops.

[1] Evidently Munzinger, who was in fact a Swiss [Ed. *S.N.R.*]

The Khedive then sent him a second battalion and with this Metzinger Pasha advanced to Amadeib (where his brother had been killed) and occupied it. The officers commanding the two battalions then asked if their regimental band could be sent up from Egypt to join them. This was approved and I went with them. My instrument in the band was the Cyprian cornet. We landed at Massawa and stayed there for six months ; then we went to Senheit where the first battalion was—about eleven days' journey by camel. At least the officers and the kit went by camel : we walked. We stayed at Senheit for three months and from there went on to Amadeib where we stayed for a month. Metzinger Pasha then asked for permission to go to Kassala which was outside his command : this request was granted and our band accompanied him on his twelve day journey to Kassala. There we had a great welcome from the Governor and I joined my family once more. My uncle and my mother were still there but I heard then for the first time the news of my father's death and the succession of my brother Idris to the sultanate of Gulli. After his visit to Kassala Metzinger Pasha returned to his command at Senheit, Amadeib and Massawa and we went with him.

At that time there was trouble at Zeila and Berbera in what is now Somaliland and Metzinger Pasha sent for a company from the Senheit garrison to deal with it. These reinforcements came first to Massawa and there our band joined them after putting our instruments into store. We went by ship to a place in Somaliland whose name I cannot remember and there landed and made a zariba. Metzinger Pasha summoned the local sheikh, but evening came and he had not appeared. In the middle of the night the sheikh and a party of tribesmen made a sudden onslaught on our zariba, burst their way in and killed Metzinger Pasha. The alarm was given and we formed a square. They then attacked us with swords but our firearms were too much for them and next day we were able to get back to the shore carrying the Pasha's dead body, and boarded our ship. The captain of the ship, who was either an Englishman or a Frenchman, went through a form of Christian burial but we took the body in the coffin back to Massawa where we handed it over and went up country again to Senheit.

After I had spent about four years at Senheit with the first battalion they sent me and two others off to Egypt where we were to be given further instruction so that we could each take charge of a regimental band. My course in Egypt lasted for a year, after which I returned to Senheit : my two companions were given posts in Egypt—one to the cavalry and one to an infantry unit.

The regimental band of which I was a member consisted entirely of Sudanese: the bandmaster was a Kunjari from Darfur while the others were from all sorts of different tribes—Nuba, Shilluk, Dinka and so on.

I spent five years between Kassala, Amadeib and Senheit, during which time I was promoted *Onbashi* and finally *Shawish.* During this time the members of the regimental band were frequently called out for duty in patrols against the local inhabitants. The way in which the government collected taxes was to send out soldiers who went from house to house with the tax-gatherers. The soldier who accompanied the tax-gatherer was entitled to take, in addition, 1 per cent of the tax for himself. This was a very profitable business for the soldiers who drew no pay during tax collection but lived on their share of the takings. Soldiers were not allowed to retire but just worked and served until they dropped. When no longer fit for active service, they were put onto light work such as looking after the officers' gardens. There was no such thing as leave of absence.

The administration of the country was purely military. The officers used to see cases and deal out punishments. The cases would be brought to them by the local chiefs who were some of them Abyssinians and some Arabs. In the more settled areas, however, there were civilian officials in government service.

We had several battles with the local people. There was a certain Maria tribe (Hamra and Zerga) living between Asmara and Senheit. They lived along a big khor called the Baraka which runs from Kofit to Senheit. They frequently refused to pay their taxes and when we went to collect cattle by force they used to attack us, but our firearms were always too much for them. After about a year they were pacified and came into Asmara with their tribute and cases. I took part also in one expedition against the Kushtan tribe which lived in the direction of Adowa. After the death of Metzinger Pasha on the Somali coast, command of the troops in our area was taken over by 'Ala' al Din Pasha and Prince Hassan, son of Isma'il Pasha. While 'Ala' al Din Pasha was in charge the 1st Egyptian Battalion made a raid on the Kushtan near the Abyssinian frontier who had refused to pay their tribute. The Kushtan attacked them at night when they were asleep and unprepared and the battalion lost about half its numbers including several officers. The survivors withdrew to Senheit.

To avenge this reverse an army of 32,000 men was sent up to us from Egypt under the command of Prince Hassan to which were added the 4,000 troops already in Eritrea. The 2nd Battalion, with which I was serving, was amongst these. We marched up towards the Abyssinian frontier by way of a place called Medin where our comrades of the 1st Battalion had been cut up. By this time our total force numbered 36,000 men. We were met by the Abyssinians whose leader parleyed with our commander (Prince Hassan) but they failed to come to terms and the battle began.

The Abyssinians attacked us in our zariba in great numbers. They galloped forward on mules and then sprang off and tore away the thorn bushes and poured in amongst us. But we held our ground and by the evening the corpses were piled high in front of the zariba. On the third day of the battle our battalion commander ordered us to leave the zariba and advance. We did so and were fighting hand to hand with the enemy when the rest of the army, fearing that we might be driven back and the Abyssinians follow us into the zariba, opened a heavy fire on friend and foe alike and killed many of our men. During the fighting I received two sword cuts and a bullet in the thigh. The Abyssinians used firearms which they discharged with lighted matches and many of their bullets were made of stone and ebony. At the end of three days fighting neither side had gained any advantage and the two commanders agreed to break off hostilities. The Egyptian army then retired but the wounded were left behind under the care of the doctors. They wished to remove the ebony bullet which had lodged in my thigh but I refused to let them do this and it is in my body today. It gives me no pain except that it aches during the wet weather. Many of our wounded had been emasculated by the Abyssinians and had died. Among the wounded who later perished was our Battalion Commander Mohammed 'Ali Pasha whom we buried on the battlefield. When I had recovered from my wounds I returned to Senheit and went on several tours with the band round Eritrea finishing up at Kassala. Before reaching Kassala we had heard of messages having been received in the countryside from Mohammed Ahmed El Mahdi telling everyone to rise and join him. Later, after he had inflicted defeats on the Turkish forces at Aba and Gedir and was preparing to besiege El Obeid, he sent further messages to the tribal sheikhs and elders telling them that he

was the expected Mahdi. The Turks then sent a battalion of mixed Sudanese and Egyptians under Mohammed Pasha from the east near Massawa by way of Kassala. This force was set upon by the Mahdists near the Um Dam in Kordofan and wiped out. News of this disaster reached us at Senheit and the whole country there rose against the Turks. The Turkish authorities at once prohibited the holding of "zikrs". A rising at Senheit followed and a battalion sent to suppress it was annihilated. By that time a new battalion had arrived at Suakin. This marched up country and met a similar fate. At Kassala, however, a local rising was crushed by a Turkish force under the command of a certain Rashid Pasha who had been sent from Egypt by the Khedive to enquire into and suppress the revolt. After he had put down the rising at Kassala, he left two of his three battalions in Kassala and returned to Egypt with the other one. After this there was a pause in the fighting lasting several months after which my battalion was sent from Senheit to Kassala to reinforce the garrison there. By this time El Obeid had fallen to the Mahdi; Hicks Pasha's army had been destroyed at Sheikan and the Mahdi himself had begun to move eastwards towards the Nile.

It was when we were in Kassala that we first heard news of the landing of British troops at Suakin.

Soon after that a large consignment of arms from Egypt reached us through Suakin and two battalions were detailed to march to Khartoum as escort for these arms to help Gordon Pasha who had arrived there. We met with no opposition on our way to Khartoum and when we arrived there heard that an order had arrived from the Khedive saying that anyone who wished to leave his post and return to Egypt could do so as the Sudan was being abandoned. On arrival at Khartoum we handed over the arms which we had brought with us and, a few days later, Gordon Pasha himself came and inspected us and had lists made of the names of our men so that we could be issued with his medal.

I had seen Gordon Pasha twice on previous occasions, at Kassala. The first time he came on a visit from Suakin and the second time he came on a tour of inspection as Governor General. On both occasions my band played for him there. Slatin Pasha also paid us a visit while I was in Kassala. The first time that Gordon Pasha came we played for him three nights running and he left a cheque for £200 which was handed over and distributed among us. The second time he gave us £50. Slatin Pasha did not give us anything.

We took our place among the garrison of Khartoum. The Dervish army was besieging Khartoum from a distance and was encamped on the banks of the White Nile to the south in the direction of Kawa. We soon heard that all the Turks and Egyptians in Dongola Province had left. Kassala also sent a number of its people to Egypt including Sayed Mohammed Osman, the father of Sayed 'Ali Mirghani, but the officials and garrisons of Khartoum, Sennar and Berber remained at their posts.

Soon after we arrived Gordon Pasha sent a messenger to the Mahdi who was approaching to say that he would not surrender Khartoum until he had received orders to do so. The Mahdi killed the messenger.

A week or so afterwards messengers arrived from the Mahdi to say that if Khartoum was not surrendered he would attack it, and Gordon Pasha then made all preparations for its defence. We had found the ramparts finished when we arrived but we added to them, digging a ditch and making a mound from behind which we could fire. The fortifications of Khartoum were very poor—nothing like so good as

those of Kassala. The ramparts then circled a very large area only a part of which was occupied by buildings, the Palace and the market. My battalion was stationed on that part of the ramparts where the Abbas Pasha barracks now stand. Our rations were slender but we were not really starving. Each soldier was issued with two and a half bowls of grain every fifteen days and also a little beef. The married men handed their rations over to their wives for cooking, but the others lived in a kind of mess and their food was cooked for them. There seemed to be no lack of ammunition. Before our arrival in Khartoum the soldiers of the garrison had been issued with pieces of paper bearing Gordon Pasha's signature in lieu of pay but these issues ceased on our arrival and we got no pay.

We had not been in Khartoum three months when the final assault on the town was made. Until then there had been no real fighting near the town but only exchanges of letters between the Mahdi and Gordon Pasha.

The final assault was made in the early morning. It fell chiefly upon an Egyptian battalion which was holding a part of the defences opposite the Mogren. They broke and fled at once. Our part of the line was also heavily attacked and though we went on firing our rifles until they were too hot to hold they finally poured over the ramparts by sheer force of numbers and anyone who remained standing was killed. Life was dear and many of us threw ourselves down among the dead and wounded while the Dervishes poured over us into the town. For several days they pillaged the city and massacred the inhabitants until finally the Mahdi ordered them to stop. We the survivors of the garrison, were collected and the Mahdi ordered us to be segregated into camps. Our uniforms were taken from us and we were dressed in Dervish clothes. The Mahdi then organized three columns, one to attack Berber, one Kassala and one Sennar. After staying for three months in Khartoum while preparations were being made, the survivors of the troops which had come from Senheit were handed over to the command of the Emir El Hag Mohammed Abu Girga for the attack on Kassala. Away we marched and came to Kassala, approaching it from the west between the Gash Gate and the Kadi's Gate. Kassala was then a strongly fortified town surrounded by a wall and a ditch. In the wall were a number of forts with cannon mounted on them.

The garrison in that part of the wall facing us was composed of Shaigia whom our leaders bribed to open the gate. I was with the party of Dervishes which first entered and we headed straight for the Mudiria. Around us were forts occupied by my former comrades whom I had left behind when we marched to Khartoum. We reached the Mudiria—a building with a row of five tebeldi trees in front—at about eleven o'clock at night. Parties were sent to bring out of their beds the Governor (Miralai Ahmed Bey Iffad), his Deputy (Bimbashi Hassan Agha)—both Turks—together with the chief merchant and the Greek army contractor. They were found and brought along while everyone else in the town was still asleep. They were ranged in a row and our commander argued with them until midnight trying to persuade them to surrender the town. They all refused and their heads were cut off on the spot. We then waited until dawn came. By this time news had gone round that the Dervishes were in the town but the soldiers in the forts did not open fire as they did not know where we were.

At dawn our Commander divided his force into sections and sent them to attack the forts at the same time sending messages to the Commanders of the forts calling upon them to surrender. Two Egyptian *bimbashis* replied that they would surrender but the third commander (a Dinka *sagh* named Abdel Raddi) refused and

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sent messages to all the rest of the garrison saying that he would die on the ramparts rather than give in to the Dervishes. As a result the whole of the garrison, other than the two Egyptian *bimbashis*, refused to surrender and the Dervishes attacked them. They resisted fiercely but with difficulty as the forts were crowded with women and children and refugees. We who had been soldiers of the Khedive did not like to fight against our former comrades and so we hung back, taking no part in the battle. For two days the garrison held out but on the third day a force arrived under Osman Digna and overwhelmed the defenders by weight of numbers. The survivors then surrendered.

We who had originally formed part of the garrison of Kassala and had been captured at Khartoum were allowed to settle down with our families in our homes in Kassala and were told to hold ourselves in readiness to serve the Mahdi. The remainder of the town was then pillaged.

After we had been at Kassala for two or three months we heard that a party of Italian troops was approaching to the relief of Kassala. They arrived to find that the town had already fallen and we went out to meet them. They were well armed and we suffered considerable losses in the two engagements which we had with them. For the second we had strong reinforcements from Osman Digna and we drove them back a long way into what is now Eritrea. We saw them no more.

Our three battalions which were composed of ex-soldiers were placed by Abu Anga under the orders of Osman Digna and we were ordered to join in the attack on Suakin. We had already heard that there had been a battle between Osman Digna and Baker Pasha which Osman Digna had won. Suakin was being invested by Osman Digna's second-in-command but without much success and we were sent to reinforce him. Our force consisted of our three battalions and two or three thousand Dervish horse. We were made to put up fortifications around Suakin to invest it and we occupied the wells at El Teb, Tamai, Handub and Gemmaiza. We used to creep up towards the walls of Suakin at night. There were always a lot of lights burning in the town and the British officers of the garrison used to have their evening meal on the ramparts by candle-light. We used to take random shots at these lights hoping to hit someone. The garrison of Suakin was on the mainland protected by a wall. They lived in tents. We seldom emerged by day but only fired on the town at night. There were several small forts outside the well which fired at us but no sorties were made. One night we collected all our forces and made a night attack on the wall but were beaten back. Soon after this the garrison in one of the forts spotted a large party of our camelmen and horsemen on a daylight patrol and fired into them causing heavy losses.

Osman Digna's second-in-command then sent word back telling him that he could make no impression on Suakin and urging him to send up the remainder of his army. In due course Osman Digna arrived and, leaving his army a short distance behind, came forward to reconnoitre the position. He then retired, taking the rest of the Dervishes with him to hold a council of war, leaving our contingent of ex-soldiers alone facing Suakin. At that moment by the Grace of God a very heavy storm of rain fell and a big wadi came down in spate between our force and the main body of the Dervishes. Our officers told us that here was a heaven-sent chance to make our escape and at midnight we set out and, after two days march, reached Akik on the shore of the Red Sea. Here we halted and camped under some trees. In the meantime news had reached Osman Digna that we had deserted and he sent a large force of mounted men in pursuit. We made a zariba round each battalion with our families inside and were preparing to defend ourselves to the last when we

saw a British gunboat steaming past. One of our officers, a yuzbashi named Selim Eff. Kirkir had been a signaller and knew some English and flashed a message to the ship using a looking-glass as a heliograph, saying that we were Turkish soldiers deserting from the Mahdi's army. By this time the Dervish horse had come into view and were rapidly approaching our zariba. The captain of the gunboat then told us to abandon our zariba so as to leave the field of fire clear for his guns. We did so and moved along the shore and as the Dervishes entered our zariba the gunboat opened fire on them. Many were killed and the remainder retired. The captain of the ship then sent a signal to say that he wished to see our commanding officers. It must be remembered that we were all dressed in Dervish jibbas and he clearly wished to make sure that our story was true. Five of our officers were taken on board over a ladder between the ship and a reef and when they returned they divided us up into detachments and listed us. In the meantime the gunboat had got a message through to Suakin telling them to send transports for us and next day an Egyptian man-of-war arrived to take us off. It could not get close enough to the shore so a small ship was sent which ferried us over in instalments with our women and children and put us onto the man-of-war which then took us to Suakin.

When we arrived there we were given new uniforms and three months' pay. After resting for a fortnight at Suakin we sailed for Suez where we landed five days later. From there we were taken by train, battalion by battalion, and put into camps at Abbassia. This was in May 1885.

About a week later the Khedive Tewfik together with Grenfell Pasha, another English general, and 'Ali Pasha Sherif came to visit us. We were drawn up in line and the Khedive's party drove along our line in carriages. They stopped and spoke to the officers and asked them questions. Orders were then issued for nominal rolls to be made and for us all to be issued with pay from the day on which we had last drawn it including the time during which we had been with the Mahdi's force. In the meantime we were drawing rations for ourselves and our families. Eighteen days later we were sent for to go to the Treasury where, in a couple of hours, we had all our back pay issued to us. We were paid in gold—partly in English sovereigns, partly in Turkish pounds and partly in Egyptian coins. We were then told to return to our barracks and await orders. We were left alone for three months and I took the opportunity to get married again. A representative of the Ministry of Pensions then came and issued each man with a discharge certificate, telling us that we were discharged on condition that we did not return to the Sudan.

About this time, the British were making arrangements to build up a new Egyptian army in place of the one which had been destroyed by the Dervishes and into this new army they prepared to incorporate the remnants of the battalions which had been rescued from the Sudan.

The garrisons of Senheit and Amadeib had been withdrawn and the forts handed over to an Abyssinian representative. With these came the garrison of Gallabat which had been able to find its way down to Senheit. These contingents arrived in Egypt about six months after we did and were all discharged in the same way. With them were contingents who had retired into Egypt from Dongola. These latter troops (i.e. the ones from Dongola and Berber) were used to form the IXth (Sudanese) Battalion in the new army. The remaining survivors were put into the Xth (Sudanese) Battalion and sent to Suakin. I was put into the training battalion with the rank of *Bash-shawish* in the band. After spending about six

weeks there I was sent as an instructor to the new XIIIth (Sudanese) Battalion which was being formed at Assuan. This was in about October 1886. A few months later, early in 1887, we sailed up the Nile to Wadi Halfa and formed part of the Egyptian frontier guard against the Dervishes. A short while later the general in command of the forces on the frontier heard that the Dervishes were planning a raid on Egypt and asked for reinforcements. The IXth Sudanese were then sent up from Egypt and joined us at Halfa. They were followed by two Egyptian infantry battalions, a company of camel corps and some cavalry. We then strengthened the defences around Halfa, making a rampart with a ditch outside. Outside the main defences were five forts. About this time Woodhouse Pasha came to take over command. The Dervishes, who had come as far as Sarras, advanced to Gamai near Amka. Two battalions were then sent forward to make an advanced fort at Khor Musa Pasha, several hundred yards south of Halfa, and did so under the protection of one of the river gunboats. For two months we slept to our arms on the ramparts and were not allowed to return to camp.

By this time I had been commissioned as a combatant officer in the XIIth Sudanese. In July 1890, I had been made *sol* in charge of the band at Halfa and was finding the work very arduous. Two of the British officers there (one of whom was the commanding officer of the XIIth) were very fond of music. Every post from England would bring a fresh supply and I had the task of transcribing it and then teaching the band to play it. These officers insisted that every evening the band should play for them one new march and one new waltz. We were in great demand to play at all the messes and I was responsible for making out all the programmes. Finally I could stand the strain no longer and put in a formal complaint explaining that I trained the band all day and then had to sit up all night transcribing the music for the next day's programme. In fact this is what has left my eyes weak to this day. My petition was passed to Kitchener Pasha and soon afterwards news came through of my appointment as *Mulazim Tani*. The commanding officer of the XIIth congratulated me and asked if I would like to serve in his battalion. I said I would and was appointed accordingly.

The 7th (Egyptian) battalion then arrived and was sent to occupy the new advanced fort. Here the Dervish Commander (Osman Azrak) at night attacked them. When news of this attack came in our commander sent one company from the IXth and one from the XIIth (in which I was serving) to their help. We arrived to find that the Dervishes had forced their way into the fort and that a hand-to-hand struggle was going on. When we arrived and attacked the Dervishes they broke and fled. In the morning we found that sixty or seventy of the Egyptians had been killed and forty or fifty Dervishes. After this the 7th battalion was withdrawn inside the fortifications and we were sent to hold the fort. When Osman Azrak heard that a Sudanese garrison was at Khor Musa Pasha he withdrew to the main body at Sarras. Nothing happened for about two months. After this the Dervishes advanced again and destroyed a scouting party of our camel corps. The IXth were then ordered to advance to Sarras which they did, driving the enemy before them, and the Dervishes withdrew to Firka. Our force at Sarras was gradually increased until we had a strength of about ten battalions. Then suddenly one Friday Osman Azrak made a detour through the hills and fell upon the market at Dabarossa behind our lines. The alarm was sounded and we were sent to Dabarossa but the Dervishes had already withdrawn having killed many of the inhabitants. Many others in trying to escape had crowded into a boat which put out into the Nile and then sank.

For several months the Dervishes left us alone and then they made a raid near Korosko killing one of our officers named Ahmed Bey El Abbadi together with a party of camel scouts who were on an outlying picquet.

So 1888 went by and 1889 came. In 1888 the XIth and XIIth Sudanese battalions were reformed and joined us. In 1889 the Emir Wad El Negumi moved against us. He advanced along the west bank of the Nile and was heading towards Egypt. The river gunboats were sent to watch him but he continued his advance northwards towards Abu Simbel. Our force was then put onto the steamers and after landing at a point to the north of his advance we made a defended position, knocking loopholes in the walls of the mud houses we found there. For sixteen days we and the Dervishes faced each other in our positions, and in the meantime Grenfell Pasha had sent up more troops from Egypt including the 1st and 2nd Egyptians. They arrived in due course together with the XIth Sudanese under Macdonald Bey and we were put onto ships and taken back to Fereik to which the Dervishes had moved. Our force consisted of six battalions. Then one evening we heard Wad El Negumi's *ombaya* being sounded and the noise of his army moving. We stood to arms at 2 a.m. and marched until mid-day following them up until we reached some hills near Toski. On our left were some of our Camel Corps and some British machine guns. We opened fire on the Dervishes at one o'clock and firing went on for two hours. Suddenly we saw a *naga* and a horse running about riderless which some of the friendlies recognized as being those of Wad El Negumi. Soon after this the cease-fire was sounded and we advanced to find the Emir and seven of his followers lying dead. However, his brother escaped and was pursued until the evening by a force under Hunter Pasha. Our general ordered the Emir's body to be placed on a stretcher and taken with us and we were then put onto the steamers and returned to Halfa. About a thousand Dervish prisoners—men, women and children—were put onto sailing boats and taken down to Egypt. About six months later, however, they were sent back to Halfa and from there to Sarras where they were released and allowed to go to their homes. Then there was another pause in the fighting.

In 1891 my battalion was sent from Assuan (where we were in reserve) to Suakin. We went by way of Luxor and then cut across the desert to Kosseir on the shore of the Red Sea. There we were embarked on a ship and taken to Suakin. At that time Osman Digna and his army were at Tokar. We advanced on Tokar with the infantry in the centre and the cavalry on the wings, and fell on them from three sides. Osman Digna himself made his escape but most of his Emirs were killed and many of his men. After this success we were sent back to Assuan by way of Kosseir and Luxor, the way we had come.

After this Grenfell Pasha went home and Kitchener Pasha took over command. Lord Cromer was in Egypt.

For a couple of years Kitchener Pasha spent his time on tours of inspection and in 1892 the Khedive Tewfik Pasha came with him. My band often used to play for him in Halfa. Soon after his visit Tewfik Pasha died and was succeeded by 'Abbas Hilmi. The latter came up to Halfa in 1893 and went as far as Sarras. It was about this time that Slatin Pasha arrived escaping from the Khalifa. By 1896 the whole army was concentrated in Halfa.

Early in the year the vanguard of the army moved slowly forward to Sarras and from there to Akasha. The XIIth went forward with them, and we left Halfa in March ; soon four battalions were camped at Akasha. The Sirdar then planned the attack on Firket which was the northernmost outpost of the Dervishes.

We, together with the Camel Corps and some maxim guns, set out at night. The Sirdar himself came with us accompanied by Wingate Pasha. We made a wide detour into the desert and marched all night over difficult country. At daybreak we were ordered to take our place on the right of the line with some field guns in the middle and some cavalry on the left. We halted on the edge of a Khor. We had been ordered to fire a shot when we were in position. We gave the signal at about half past five and then the rest of the army, which had been advancing along the river bank, formed line and attacked the Dervishes. We could hear the sound of their volleys. Then our guns were ordered to fire and we lay down while the shells went over our heads. The Dervishes were thus hemmed in and were destroyed by our fire. The Emir (I think his name was Idris Hamouda) and his sister were found lying dead on their prayer mats. He was a Habbani, a relative of my mother's, but I was a soldier in the service of the Khedive and had to fire like all the rest. Osman Azrak escaped with a small party of horsemen but nearly all the Dervish army was killed or taken prisoner. The wounded were handed over to the hospital and the unwounded sent to Halfa. Next morning at 9 o'clock we and the camel corps and the maxims under Hunter Pasha went in pursuit of the remnant of the Dervishes. We marched all day and at midnight arrived at Suwarda where Hassan Wad El Negumi was. When he heard that we were coming he put his army onto boats and crossed over to the west bank of the Nile. We found his camp deserted except for a lot of stores, but were forbidden to take anything except what we wanted to eat. We made no zariba round our camp that night. At mid-day the rest of the army came up. We made our camp a little distance away from the Dervish camp and made ourselves huts out of the trunks of palms, and there we stayed for three months. During this time the engineers at Halfa had been putting together the river gunboats and the "Fateh" and the "Nasir" had been completed. The Xth were on guard over prisoners while the Egyptian battalions worked at the building of the camps and the railway line. In September the river rose and the "Fateh" came upstream and joined us. On board it was a detachment of British soldiers. We then advanced along the shore while the "Fateh" steamed beside us up the river and so arrived at Fereik (a different Fereik this time). The gunboat scouted upstream and saw no signs of the enemy so we advanced to Abu Fatma. The gunboat then went on to Kerma and found a party of the enemy on the west bank under the Emir Wad Bishara. We were then ordered to advance and approached Kerma. The Dervishes fired on the gunboat which replied and then our guns were ordered forward and opened fire on the Dervishes across the river. We had dug ourselves in by this time but at mid-day we were ordered to start firing volleys at the enemy on the other bank. The enemy then retired. This was at about 3 p.m. The gunboat sailed on and found the Dervish camp deserted. We spent all day crossing the river and then made a zariba. Next day the gunboat brought the cavalry and camel corps up to join us and then returned to fetch the Xth. The whole force then advanced with a fringe of scouts out in front and sleeping in a zariba every night and in seven or eight days came to Dongola. On the way we came on Wad Bishara's horse lying dead. When we reached Dongola we found that the army of Yunis El Dikeim had abandoned it. The British contingent disembarked and advanced along the shore as far as Old Dongola. Here they were picked up again by the steamer which took them back to Halfa. They had been brought in case there might have been Dervish resistance at Dongola. Kitchener Pasha and Hunter Pasha also returned and Macdonald Pasha was left in command of us. We then advanced to Khandak and finally came up with Osman Azrak at Debba but he withdrew and all we captured were some of his family. The river here was too shallow

for the big steamer so the two smaller ones were sent back to bring up our supplies from railhead which by that time had reached Kerma. We and the XIIIth were at Debba, the XIth at Korti, the IXth at Merowe and the Xth at Dongola, and so we awaited the Nile flood of 1897.

The Sirdar had heard from 'Abdalla Saad of Metemmeh that he would join the expedition and asked for help. The Sirdar sent a mounted column forward to his help but before they reached Metemmeh they got news that the Emir Mahmoud had massacred all the inhabitants of Metemmeh.

My battalion were then ordered to go downstream to Kerma whence we were taken by rail to Halfa and from there along the new railway line across the desert as far as what is now Station No. 3. There the line ended and we then marched to Abu Hamed. Our water was supplied by camel transport but it was a hard march. When we reached Abu Hamed we found that the Xth had attacked the Dervish garrison and taken the place. After a further thirteen days march with the railway line following us along slowly we reached Berber. The Dervish Emir at Berber, El Zaki Karrar, retired abandoning his fortifications. The reason for this retreat was that a certain 'Abdel 'Azim Bey who had been sent on a detour inland away from the Nile suddenly appeared at Berber before the rest of the army had arrived and so alarmed the Dervishes that they retreated. This was in December, 1897.

Throughout our march we had been received with the greatest enthusiasm by the Danagla and the Shaigia. They were very poor and had hardly any clothes but they lined the roads everywhere and cheered us as we marched past. The next few months saw the railway arrive at Berber after great efforts by the engineers and from there it was pushed on to Dakka near Atbara. In February and March, 1898, the whole army was concentrated at Berber and an advance was made to Salama and Um Adara and finally to Um Debeiha where we were halted in one large zariba. Our force consisted of three or four British battalions under a brigadier, then the IXth, Xth and XIth Sudanese and 7th Egyptians under Macdonald, the XIIth, XIIIth and XIVth Sudanese and 8th Egyptians under Maxwell, the 1st, 2nd and 3rd Egyptians under Lewis and the 4th, 5th and 6th Egyptians under Wilkinson (who was afterwards killed by a lion at Kassala). The transport and auxiliaries were under Hickman.

On 8th April, 1898, we left our camp at Um Debeiha at 5 o'clock in the evening and were drawn up in a hollow square. We and the Egyptians formed one side, the British another, and the other troops and the baggage a third side. When the parade was ready a platform was brought forward and the Sirdar mounted it and made a speech to encourage us and to ask for God's help in the coming battle against the Emir Mahmoud Ahmed. We were greatly encouraged by his words and our hearts were warmed for the battle. With one voice the whole army gave a cheer and raised their rifles in the air. We felt that we were unconquerable. We moved off at 6 o'clock with strict orders that silence be kept and no lights lit. We marched in square formation. Each man kept close to his comrades on either side of him and it was very hot. After an unbroken march of five hours we halted in formation and ate some food and then marched on for another four hours. As dawn was breaking we came within sight of Mahmoud's zariba. There was no movement and the Dervishes seemed to be still asleep. The army then deployed with Maxwell's brigade (in which I was) on the right, then Macdonald's brigade and then the British brigade. The Egyptians were behind in reserve and also the baggage square. By 6 o'clock the line was in position. The Sirdar then ordered the artillery to divide up—three guns being put beside each battalion. At daybreak fire was

opened with incendiary bullets onto the camp which burst into flames. After an hour's firing when the camp was in flames the men who fired the incendiary bullets were withdrawn and the field guns pulled forward and fired for half-an-hour. The enemy were crouching in their trenches which extended backwards for twelve lines or so behind their zariba. The guns were then pulled back and the Dervishes at once emerged from their trenches and opened fire on us. Our losses from this fire were very small. We then fixed bayonets all along the line. Each band then played its regimental march, the officers went on in front and we advanced, firing volleys as we did so. We were provided with ladders made of iron covered with thick canvas which were thrown onto the thorn zariba. They were too short to cross the whole zariba but we forced our way through the remaining branches and into the Dervish encampment. We advanced into the defences in battalion order, with the Dervishes firing at us as we came. Our men began to drop and were tended by the doctors who came behind. The reserve battalions formed up inside the gap we had made while we advanced towards Mahmoud's headquarters. As we approached the enemy broke and fled across the river. We poured a heavy fire into them and many fell. Many of the Emirs were killed but Osman Azrak who was opposite the British brigade made his escape with the camel corps and cavalry after him. We were then ordered to search the zariba and sweep across it clearing all the trenches of the remaining enemy. While doing this the company with which I was found Mahmoud. A woman emerged from a shelter and told a British officer that he was still in there alive. As we advanced upon his shelter his guards opened fire on us and several of our men were hit. We shot several of his guards and then called out to him that he must surrender or we would pour a volley into his shelter. He then called out "Aman" three times and came out, with a woman and a slave. He was light in colour with no hair on his face, dressed in a short Dervish jibba and drawers and shoes. He had nothing on his head and no arms in his hands. News of his capture was sent to the Sirdar who had pitched his tent under a tree. We formed a guard round Mahmoud and marched him off to the Sirdar. He was sitting outside his tent dressed in a shirt and breeches with a knife and revolver in his belt. With his big black moustaches he was a frightening figure. We halted fifty yards away and the Sirdar came forward. Mahmoud started trembling but we told him to bear up. Kitchener came and shook him by the hand and then took him by the arm and they talked for a while.

An order was given that our two battalions which had captured Mahmoud were to escort him back to Berber while the others remained on the battlefield to bury the dead and attend to the wounded. By half past two in the afternoon the fighting was over and after an hour's rest we paraded again and started our march back to Berber with Mahmoud. Our wounded followed in litters. We marched till 10 o'clock in the evening and halted for the night. We had no blankets and slept on the ground. At 2 o'clock in the morning we started again and entered Berber at about 10 o'clock. Everyone had already heard that Mahmoud Ahmed who had boasted that he would invade Egypt had been defeated and captured. News had been sent round as to which roads we should march along and they were packed with women and girls. The Xth went on in front, then Mahmoud on foot with a guard round him with fixed bayonets to protect him from the crowd and then the XIIth. We marched through the streets of Berber amid cheering crowds. Mahmoud held his hand over his mouth and tears ran down his face. Next day he was sent away by train to Halfa and thence to Egypt.

Two days later the rest of the army returned from the battlefield. We stayed on and around Berber for three months by which time the railway line had reached Dakhla near Atbara where the bridge over the Atbara river now stands.

In July we were on the move again. The whole army was transferred to Wad Hebeish on the west bank. Here a small party of mounted Dervishes approached our camp and I was given the task of chasing them away. I went forward with my platoon and sent some of my men up trees to act as look-outs. Soon the Dervishes approached and were spotted by one of my look-outs. He came back with the news and I led my platoon forward. The Dervishes had a couple of scouts on ahead who saw us and retired on their main body. I then advanced, having sent word of what was happening back to my company commander. I made a square with my platoon and the Dervishes attacked us riding on camels. I waited until they were quite near and then opened rapid fire on them. They all fell except nine men of whom we were able to take four prisoners. The remaining five escaped. I only had one man wounded. After sending back word to the main body we remained on guard over our prisoners until Maxwell Bey came up to question them. I was ordered to collect the animals and the property of the dead. We were told to take only the arms and the rosaries of the dead but not their clothes. I then returned to the main body and handed everything over. Maxwell Bey took a report back to the Sirdar who was very pleased. He sent me a reward of £120 of which I kept £40 myself and gave the rest to the soldiers of my platoon. My platoon *shawish* and an *onbashi* were promoted.

After questioning my prisoners our commander knew that the Dervishes were in force near the Shabluka gorge and the whole army then moved forward to Wad Hamid near the entrance to the gorge. The Nile rose and one of the gunboats was able to steam up the river and attack the Dervish position, but the Dervishes saw it coming and retired. After cutting enough wood to provide fuel for the gunboats we left the river and marched round outside the gorge while the gunboats went on upstream and fired a few shells into Omdurman and returned.

Then our army advanced along the west bank and early on 1st September, 1898, we arrived at a place called Ard Esh Shifa near Kerreri and dug ourselves in. Inside our semicircular zariba with our backs to the Nile Macdonald's brigade was on the right, Maxwell's in the centre and the British brigade on the left. The camel corps were to the north of the zariba near the Kerreri Hills. Lewis' brigade was in reserve. We worked on the zariba until mid-day and made shallow entrenchments inside it. In the evening the Dervishes marched out of Omdurman and occupied Jebel Surgham. The gunboats turned their searchlights onto them and watched them massing until 4 o'clock in the morning. From 2 o'clock we were all standing to with our baggage animals packed. At about 4.30 a.m. we had orders to advance from our zariba but before we had time to obey we saw the enemy advancing. We heard the *ombaya* sounding and at 6 o'clock the attack began. We held our fire until the order was given and then fired in volleys. The machine-guns also opened up. They fell in hundreds and finally the Emir Yagoub fell near our zariba and we went out and brought in his Black Flag. By 11 o'clock the attack had been broken and we left our zariba and advanced. Another attack was made on Macdonald's brigade on our right but we had no serious opposition and we advanced until we reached Shambat about 2 o'clock in the afternoon. We then advanced on Omdurman with the British brigade beside the Nile, we on their right and the Egyptians behind. At 4 o'clock we reached the gates of the city near where the Civil Hospital now stands. The British brigade went in along the river bank past

the Dervish forts while we entered through the Mosque Gate and surrounded the Khalifa's House. Two tall Dervishes (from the Fung near Singa) came out asking for quarter and said that the Khalifa had collected his family and left some time before. Kitchener and his officers then entered the house and found it empty.

The troops were then told off to occupy the different quarters of Omdurman. For three days we pillaged the city and then order was restored. A flying column was sent in pursuit of the Khalifa. We remained in Omdurman but the British brigade, which was camped in the ruins of Khartoum itself, went home.

In October news came that the Emir Ahmed Fedil, who was at Gedaref, was about to try to join forces with the Khalifa. Kitchener heard that he was at Abu Haraz on the Blue Nile near Medani. Maxwell Pasha was ordered to send a force to deal with him, and the XIIth (with which I was still serving) were despatched. We sailed from Shambat on the "Fateh" for Abu Haraz while two companies of camel corps accompanied us marching along the shore. We landed at Abu Haraz and left the river in pursuit of Ahmed Fedil who had left in the direction of Gedaref. After marching for twelve days we reached Gedaref. There we found the 16th Egyptian battalion which had arrived there from Kassala. We left the Egyptian battalion at Gedaref and marched towards where Ahmed Fedil was reported to be. After two days' marching we came in contact with him and some of his men opened fire on our camp at night but were easily held off by our outposts. Next morning we attacked him and he and his force were driven back to Assar and from there to Doka and from there to Jebel Beila. Here his force disintegrated and fled to the river Dinder : we pursued them and captured about 2,000 prisoners and an Emir called Abu Bakr and a Sultan called Wad Banga. The Xth took up the pursuit and drove them into the river but Ahmed Fedil himself escaped and finally joined the Khalifa at Gedir after crossing the Rahad and the Blue Nile, by which time he only had about sixty followers left out of his original army of 12,000 men. From the Dinder we returned to Gedaref and stayed there for a time after taking over from the Egyptian battalion.

We built a fort at Sofi and sent our prisoners back to Omdurman to be enlisted as soldiers : they were mostly Kungara from Darfur. Hickman Bey was sent as Governor to Dongola and I went with O'Connell Bey (afterwards Governor of Kordofan) to Gallabat taking with us the son of Sheikh Saleh Sharga who had been killed by the Dervishes. We installed him there and raised the two flags on the Abyssinian frontier. We stayed there for a month by which time a *mamur* was sent to take over. On our return to Gedaref we had a visit from Kitchener Pasha who issued us with medals. We then returned to Omdurman.

Towards the end of 1899 we left by steamer with a powerful force in the direction of Kaka. When we arrived there we landed and were preparing to march inland when a letter arrived from Wingate Pasha by the hand of a *bash-shawish* of the camel corps telling us that the Khalifa had left Gedir heading westwards and might then be starting back towards Omdurman. We embarked again and returned to Omdurman where we were settled in barracks with headquarters in the Khalifa's house. Wingate Pasha did not return but sent a message asking for two battalions. The ones detailed for the expedition (which did not include the XIIth) were despatched by steamer, together with some levies, and took part in the action which ended in the defeat and death of the Khalifa at Gedid.

The Sudanese regiments were then posted on garrison duty in various stations—the IXth at Medani, the Xth at Assuan, the XIth at Kassala, the XIIth at Dongola, the XIIIth and XIVth in Omdurman and the XVth at Berber. This dispersal

followed an incident in which the Sudanese regiments had been ordered to hand in their ammunition. This was done in order that fresh ammunition might be issued but someone spread the rumour that the British regiments would be ordered to shoot down the Sudanese. I handed over my unit's ammunition to Cameron Pasha (afterwards Governor of Singa) but many refused to do so. Jackson Pasha ordered an inquiry through Maxwell Pasha and a number of officers, mostly Egyptians, were found guilty of spreading these rumours and sent off to Cairo under arrest. My regiment (the XIIth) went to Dongola but a year or two afterwards we were sent to El Obeid, from where Dickinson Bey had been appointed Governor at Medani. After serving for five years at El Obeid, I was posted to the Bahr-el-Ghazal.

[Here the narrative, which takes us down to the end of 1905, comes to an end. After periods spent on garrison duty at Wau, Tewfikia, Yambio, Omdurman and Mongalla, 'Abdullah Adlan was retired on pension on 1st January, 1915. In September, 1920, he was placed in charge of the *Redief* at El Obeid and finally retired from all military duties on 20th September, 1931—no less than sixty-eight years after his enlistment at Kassala in the Khedive's army in 1863. He continued to take an active part in public affairs in El Obeid, serving on the local bench of magistrates and in other voluntary capacities and enjoying life to the full until his death, full of years and held in high esteem by all around him.]

A CORRECTION TO INFANT MORTALITY

by

Karol Józef Krótki

1. *Ethics of census-reporting*

The temptation to make the results from the First Population Census of Sudan 1955/6 (hereinafter called : First Census) appear more reasonable than they were was successfully resisted. No doubt, in this way the First Census would be exposed to criticism on grounds of subsequent consistency checks, should as a result of such checks inconsistencies be found. It can be doubted whether within any reasonable time available for publication of census reports, all the results could be forced into conformity with all possible consistency requirements. The First Census is also exposed to controversies should students of demographic problems in Sudan be ready to argue on the basis of "hunches". As a *quid pro quo* it is hoped that a successful bid has been made for the less vocal, but more appreciative gratefulness of subsequent researchers by presenting the raw, unadjusted figures as they were collected. Superficially, it might appear that it would have been safer to work to a set of predetermined rules. Some such suggestions as that a certain age-group must not be more or less than x per cent or the crude death rate must not be less than y per thousand, could have been adopted. It is known that such rules are being made when the occasion arises. In fact, arrived at on common sense grounds or on the basis of empirical evidence elsewhere, they could have made matters worse in spite of improving the external look of the census figures. It is only after careful inquiry that some real doubts may arise in specific cases about the realism of some of the census figures. Furthermore, even if doubts about realism of some figures arise, the nature, magnitude and direction of corrections required can not often be determined at all, or only after considerable further probing into the material and application of other consistency checks. (It will be noted that the more ambitious question of accuracy, that is exact accuracy of figures, as distinct from the vaguer concept of realism or acceptability or reasonableness, is not discussed here, though some remarks on the subject of accuracy will be made at the end of the paper.)

Such enquiries, however, require more attention and deserve more consideration than it is profitable and possible to allot to them during the high-pressure period of turning out the thousands of figures for printers. In any case, some of the conclusions from such enquiries are bound to be tentative and other researchers may not agree with them. More research, further evidence, subsequent surveys, a later census may furnish additional grounds for accepting or rejecting in a more definitive way some of the earlier, perforce tentative, conclusions. The history of research knows many examples of how the zeal of the primary reporters, limited or even destroyed altogether any useful work which secondary researchers could carry out. It is firmly believed by the present writer that results of the field work are sacred. The original figures should therefore be published in the first instance, as a point of professional ethics, unamended and unadjusted. On no account should they be "cooked" and made appear "more reasonable". When time, finances and personnel permit, subsequent work on them may be done to the heart's content. But the original—to repeat—is sacred. If they are so bad, that they cannot be published without adjustments, then they do not deserve such adjustments either. Even if seemingly absurd, they should still be published in virgin form rather than adjusted.

What looks absurd today, may not be so tomorrow. In any case, any one adjustment may have important methodological and/or substantive implications in other parts of the material and should not be undertaken in the hurry of preparing original material for publication. As an alternative, but a poor second, if the alleged elegance of "cooking" cannot be resisted (and there is a less disturbing word for it, namely : forcing) then it should at least be reported upon in detail including the original data. Alas, the present writer has seen quite a number of cooks in several countries, but few confessions.

It is this general philosophy which has guided the preparation of the reports from the First Census. It is indeed fortunate that not even the most obvious "cooking" has been undertaken. It is already known, that at least some of the suggestions advanced would have actually lowered the usefulness of the figures, rather than improved them. Others would be detected through consistency checks, not apparent at the time the suggestions for "cooking" were made.

Unearthing and disclosing shortcomings, if indeed they can fairly be called shortcomings, in the course of a discussion of a country's census results means no discredit to the country concerned. With the interest Sudan provokes in the world nowadays, they would be discussed sooner or later anyhow and imperfections would be revealed. "Any one familiar with the scale of effort required to complete a census of population and with the necessarily limited resources made available for the job should not be surprised that the enumeration is less than completely exact. The fact that . . . [thousands of], . . . inexperienced enumerators and . . . supervisors serving with moderate pay and no prospect of prolonged employment conducted the actual . . . canvass leads naturally to the expectation that not every person . . . was properly counted. No amount of care and planning by the . . . [census HQ-s] . . . could insure perfection on that part of all the numbers of a large army of temporary employees. Similarly, the best designed questionnaire and enumerator's instructions could not guarantee that the respondent would give and the enumerator record accurate information about all the members of a given household" (Coale, 1955). This quotation refers to a country very different from Sudan : it is four times bigger in area, sixteen times bigger in population size, with a budget of the national Government 500 times bigger, with standards of literacy, administration, communications many, many times higher, with national income per head thirty times bigger. If made with regard to such a country, how equally true they must be in the case of Sudan.

2. *Infant mortality as reported during the First Census*

One of the "unreasonable" results of the First Census is the low infant mortality. Infant mortality is of considerable sociological and other significance in its own right. Particularly so, in underdeveloped countries, where the toll of life at the early stage is heavy. Until recently it has also been considered an important general indicator of demographic, health, economic and social conditions. Writers in the field considered it a "sensitive" indicator ; sensitive in the meaning, that if general conditions, whether over time in one area or between areas at any one time, were such that they resulted in higher over-all mortality at one point than at another, infant mortality would have been proportionately still higher. Recently it has been shown (Stolnitz, 1956), that without prejudice to other definitions of sensitivity, infant mortality is no better indicator of over-all mortality than mortality measures at other ages (in demographic parlance : age-specific death rates or survivorship ratios). Be that as it may, infant mortality is a useful indicator. It is often available

when others are not. It does not depend on the age distribution as the over-all crude death rate does. (The required terms are defined below.) In demographic parlance it is age-standardized. When really high, it can be used more dramatically and, therefore, more effectively for presentation to the legislature, press, statesmen, the thinking public. When a third or nearly half of the babies die within the first year of their births, the over-all death rates are no doubt also very high, but the high infant mortality rate at least *appears* to indicate the biggest hole to be plugged. While such a focusing of attention may be misleading, if Stolnitz is right and if his corrections apply to Sudan, the sheer magnitude of the problem deserves separate consideration. Not that infant mortality can very well be improved without improving general health conditions at the same time and *vice versa*. It is a big, important figure. It is a figure used often and will continue being used frequently during discussions at high levels and in international exchanges, even if its limitations are pointed out. It is, therefore, of some importance to be certain about its magnitude and reliability.

In Sudan infant mortality will share, together with a number of other indicators, the increasing importance of comparisons after the Second Census or some other relevant surveys have been conducted and reported upon. For many purposes we may be satisfied with the roughest indications of magnitudes. Indeed for many decisions at the general policy level accuracy of the order of 50 per cent or even less may be quite satisfactory. On the other hand to watch a trend, much greater precision is required. If our results are subject to, say, 20 per cent error, a trend change of 10 per cent will easily be lost in the error, irrespective of whether the trend is of the same or opposite direction to the error.

I already had an opportunity to report on the infant mortality to the Sixth Annual Conference of the Philosophical Society of Sudan (Krótki, 1958, p. 34). The same feature was brought out during the Pilot Census in 1953 (Krótki, 1955, p. 134). In both connections it was noticeable that the infant mortality in Sudan appeared to be relatively lower than the crude death rate when both these ratios were compared with experience elsewhere in the world. If true, it would have meant that the chances of survival of a Sudanese citizen in the early stages of his life were substantially better when compared with countries with chances of survival in a later period of life equal to Sudan. It is not unusual in countries with poor health conditions for the relative probability of survivorship to improve during the early period of life and even for the absolute expectation of life to lengthen once the dangers of the high mortality during the very first months of life have been withstood. It appeared that in Sudan these dangers seemed to be lower than elsewhere.

Was it a real phenomenon characteristic of the peoples of Sudan or was it a freak of the census procedure ? Now, it is a well-known fact that infant mortality is concentrated in its incidence in the very first days after births. Very roughly it may be said that one third of all infants who die in the first year of their lives, do so on the first day, one third in the next thirty days and one third in the remaining eleven months. The dividing line between at least the first one third of infant deaths and stillbirths (about which no questions were asked during the enumeration), abortions, miscarriages of various sorts, must be a thin one. It is thin not only conceptually, but must also have been blurred in the memories of the respondents. For the benefit of those who are unfamiliar with the procedures of the First Census it may be explained that the answers to the relevant questions were collected on the basis of people's memories, there being no worthwhile documents in this respect in Sudan. It would be only natural if cases of infants who died soon after being born were

forgotten. Or if not forgotten, for a variety of reasons, not reported. "Surely those big *mudirs* (governors) from Khartoum, or even from district headquarters, could not possibly be interested in such unimportant events". Additionally there would have been obvious inducements to pass over in silence cases of infanticide and undue exposure.

A detailed enquiry has, therefore, been made into the relationship between infant mortality and deaths at all ages elsewhere and in Sudan. No claim is made that Sudan *must* behave like other countries. If it were so, not only would "cooking" be justified, but many a practical statistician in the field would lose their jobs. Nevertheless, the presumption at least exists, that if other countries behave according to a pattern and Sudan is the odd country out, some not unreasonable conclusions about the Sudanese figures can be drawn ; particularly, if there is some evidence pointing to consistency of these conclusions with other features. Those of the readers who think that this line of thought is unjustified should stop here, but others prepared to chance their arms with the writer are invited on an interesting exploration.

For the benefit of non-demographers and those unfamiliar with the First Census some definitions are given. *Infant mortality rate* (referred to hereafter as IMR) as used for the purposes of the First Census is the number of infants who died during the twelve months prior to the enumeration, while aged less than one year at the time of the death, per each 1,000 babies born during the same period. Practised demographers will have noticed immediately that the two kinds of infants do not quite come from the same period. Those in the denominator have all been born during the last twelve months. At least some of those in the numerator have been born in the previous period, the implicit assumption being that of the first lot (those born during the twelve months) a similar number or proportion will die in the subsequent period of twelve months. The realism of this assumption is discussed in the next paragraph. *Crude death rate* (called thereafter : CDR) is the number of persons of all ages (i.e. including the infants) who died during the twelve months prior to the enumeration per 1,000 persons of all ages alive at the time of enumeration. There is no virtue in the figure of 1,000 in either case. It is used solely to avoid an uncomfortable number of decimal places.

There are some discrepancies between the above definitions and those used in other countries, but their numerical importance must be small. They can, probably, be ignored in an enquiry conducted at the present level of approximation and generality. Particularly do the Sudanese figures depend on the assumption of even flow of vital events throughout the year.* To take the second point first. If the population grew during the twelve months of the enumeration at the rate of 3 per cent per annum, the population at the time of enumeration was 3 per cent greater than twelve months earlier. Vital events which took place during the intervening period were, therefore, arising out of a population smaller than at the time of enumeration. Thus all ratios with the total population in the denominator are lower than they would have been with an appropriate population. The appropriate population in this case would have been the total number of years lived by all the people during the twelve months prior to the enumeration or, on the assumption that the increase in the total population followed a straight line, the total population at the point of time six months prior to the enumeration. However, as will be apparent later, our figures do not deserve the kind of refinement which would be necessary to deal with this difficulty.

* They also assume that there was no growth throughout the year.

The even flow assumption is necessary because, e.g. should there be a seasonal heaping of births at the time of the enumeration, the infants would be enumerated, but the high proportion due to die in the near future, would not yet be reported and registered as such. True, if the heaping was seasonal, their counterpart last year should have been reported, but being so young and the event having taken place nearly a year ago, it is probable that a higher proportion of them would be forgotten, than if the births were evenly spaced throughout the year. This possible seasonal heaping of birth occurrences must be distinguished conceptually from the heaping of infant deaths soon after the births and which has been discussed earlier in connection with respondents' recollections. The even flow assumption deals with both of them.

Later on in the argument the *crude birth rate* will be referred to and it is convenient to give its definition now (C*B*R). It is the number of babies born during the twelve months prior to the enumeration per each 1,000 persons of all ages alive at the time of the enumeration. The preceding discussion of difference between the Sudanese definition and some of those used elsewhere applies to it also.

While drawing attention to the possible sources of inadequacy of the Sudanese figures, we should admit to the existence of at least three others. The Sudanese data are all one-year figures and, should the Census year have been a freak year, they may not be representative of the normal reproductive behaviour of the population concerned. Secondly, in at least some areas the figures concerned are very small and as such unstable, irrespective of whether coming from areas enumerated fully or by sampling methods. The mere smallness makes them unstable and, therefore, unsuitable for drawing too fine conclusions. Thirdly, most of the figures are the results of samples and therefore subject to sampling errors ; and, where the result of full enumeration, are probably subject to even bigger errors of bias and enumeration, as full enumeration was conducted—more or less by definition—with lower standards. The samples were respectable probabilistic samples with low standard errors for the population as a whole, but higher for most, if not all, parts thereof. This statement is valid whether the parts arise from a geographic division or are divided by any one or more of the other characteristics. However, be that as it may, let these limitations of the exercise be put among those other aspects which will not be discussed in this paper. In any case no important conclusions will be drawn on the basis of small differences.

3. *Phraseology and standard abbreviations*

To avoid misunderstandings, to prevent repetitions and to dispense with lengthy discussions in the text, it is convenient to coin phrases with definite meaning behind them. It is suggested that the correction to infant mortality, which is the subject of this paper, and all the other consequent corrections arising from it, may be referred to as :
*I*nfant *M*ortality *C*orrections, abbreviated into IMC or
*I*nfant *M*ortality *c*orrected, also abbreviated into IMc.

Other useful abbreviations suggest themselves (some already used) :

IMR	for infant mortality rate or rates
CDR	for crude death rate or rates
C*B*R	for crude birth rate or rates
N-IDR	for non-infant death rate or rates
IMcIMR	for infant-mortality-corrected infant mortality rate or rates
IMcCDR	for infant-mortality-corrected crude death rate or rates
IMcC*B*R	for infant-mortality-corrected crude birth rate or rates

Precise definitions are provided in the text. Also in the text are provided descriptions of the following standard expressions used in the paper :

Simple World Line
Simple First Census Line
Pilot Census Line
Coale-Hoover Line
N-IDR World Line
N-IDR First Census Line

4. *Comparisons with infant mortality elsewhere*

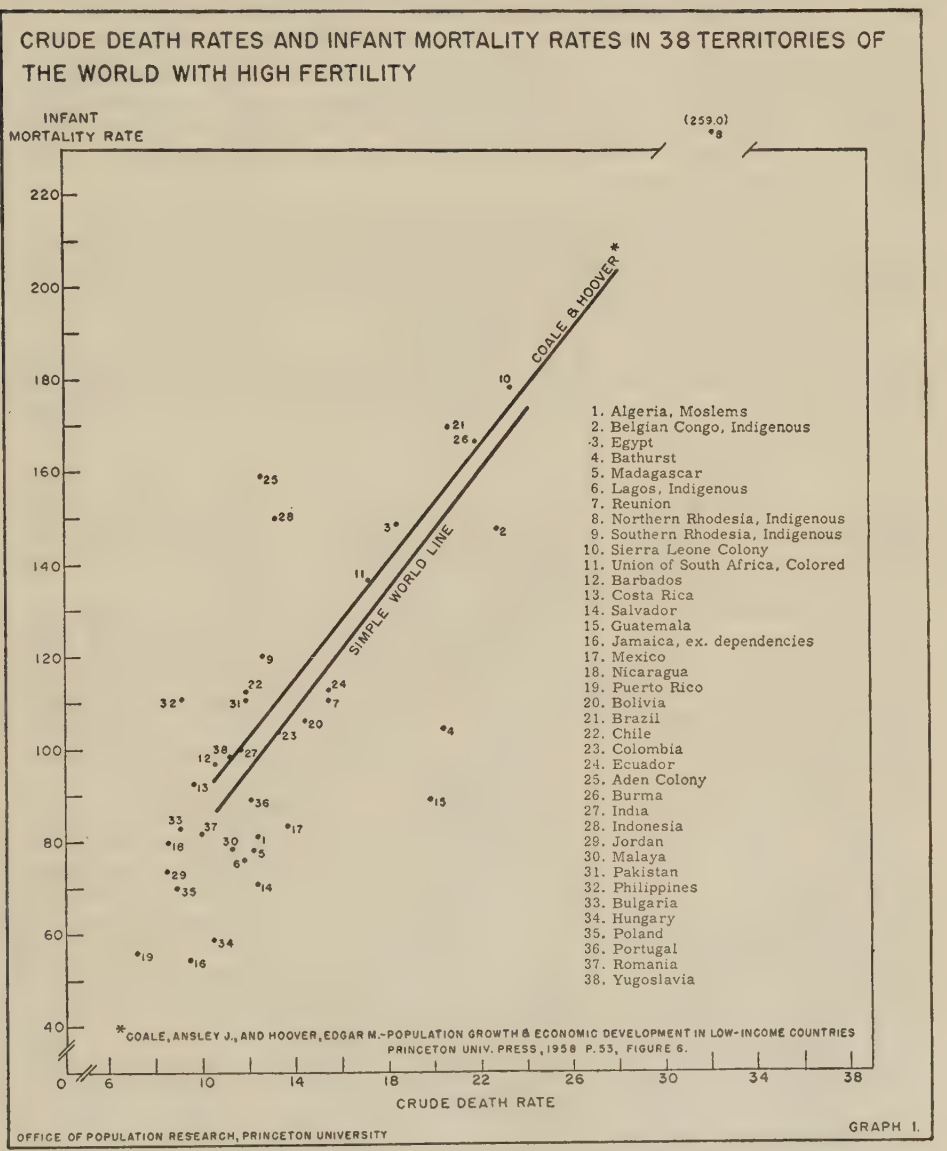
Thirty-eight territories with high fertility have been chosen from those for which all three measurements, namely IMR, CDR, and C*B*R were easily available. The reason why only areas of high fertility have been used is that in areas with low fertility, both the infant mortality and over-all death rate might be expected to behave according to a different pattern than in Sudan. There has been no selection in the meaning used in statistical sampling. All thirty-eight territories with high fertility (United Nations, 1957, tables 6, 8 & 9) have been used. The infant mortalities (IMR) and crude death rates (CDR) have been plotted on graph 1. On graph 1 are also given the names of the thirty-eight territories concerned. With regard to a substantial number of these territories, it must be admitted that the reliability of their vital statistics is very low and that, therefore, any orderliness in their mutual relationship may be purely coincidental. On the other hand for the following argument we do not need complete reliability. It will be obvious, that all that is required is that in any one country both the IMR and CDR be *equally* bad. It is of no concern to this paper whether they are underestimated by as much as 50 per cent or more. The distribution as plotted on graph 1 was found to have a coefficient of correlation (r) = ·83. A coefficient equal to 1·00 would have meant that the relation of IMR to CDR is absolutely unique, that e.g. if we know any CDR there would be one and one only IMR associated with it. In short, knowing one of the two ratios for any one country, we could state without fail the other one. A coefficient equal to 0·00 would signify complete lack of any relationship, i.e. full random distribution. A coefficient equal to −1·00 would again indicate a unique relationship, i.e. complete predictability, but of opposite direction ; that is, in our case, high IMR associated with low CDR and *vice versa*. Experience teaches that r = ·83 is as high as one may hope to expect in social sciences. However, not too much must be made out of this point for two reasons. Firstly, we are not entirely in the field of social sciences. There are considerable biological and physiological aspects. Secondly, it is one of the conditions of the reliability of r that the entities measured by it must be independent of each other. In our case, the CDR is not independent of IMR, because as we have seen, the number of deceased infants of the latter enters into the number of deceased persons of all ages of the former.

However, be that as it may, a regression line has been calculated and found to be of the form :

$$\text{IMR} = 17 + 6{\cdot}5\ (\text{CDR})$$

This line (called hereafter : Simple World Line) has been drawn on graph 1 and with the value of r it summarizes the information on the graph. It suggests that the higher the CDR, measured along the horizontal line, the higher the IMR, measured on the vertical line, but higher 6·5 times. It is hoped that nobody will take this line too literally. As it stands, it has an obvious absurdity built into it.

It is biased like any other regression line not passing through the origin of the axes. If we could imagine a territory with nil CDR then according to the above formulae the IMR would still be equal to 17, an obvious contradiction. Secondly, an optical



inspection of the distribution of dots suggests that the distribution in the lower part is erratic and that we can be grateful for the high coefficient of correlation to the fewer dots in the higher part which have spread themselves into an elongated patch.

It is a remarkable coincidence that a line connecting similarly these two ratios in some areas in India (Coale & Hoover, 1958, p. 53, chart 6) is practically identical with our Simple World Line. Too much must not be read into this coincidence, but it should probably be pointed out that these Indian rates come from a few specially selected Health Units where each pregnancy was recorded early in its history and followed by trained workers until completion and well after. There may still have been some underregistration, but the data give as least as accurate *minimum* figures as can be secured in the circumstances of an underdeveloped country. It will be noted that our straight line summarizing figures from countries where presumably less care has been exercised than in the Indian Health Unit lies below the Coale–Hoover Line.

In fact it is surprising that the Coale–Hoover Line does lie above the Simple World Line only to the extent of some nine infant deaths. What is known generally of the underregistration of infant deaths would lead one to expect, in an area where the registration was near complete, that the difference should be much greater, but then perhaps the registration in these Health Units was not all that near perfect.

In graph 2 the IMR and CDR of the ninety-four Census Areas, the nine Provinces and the Sudan as a whole, have been plotted. The regression line for the ninety-four Census Areas has been calculated and was found to be of the form:

$$\text{IMR} = 38 + 2{\cdot}8\ (\text{CDR})$$

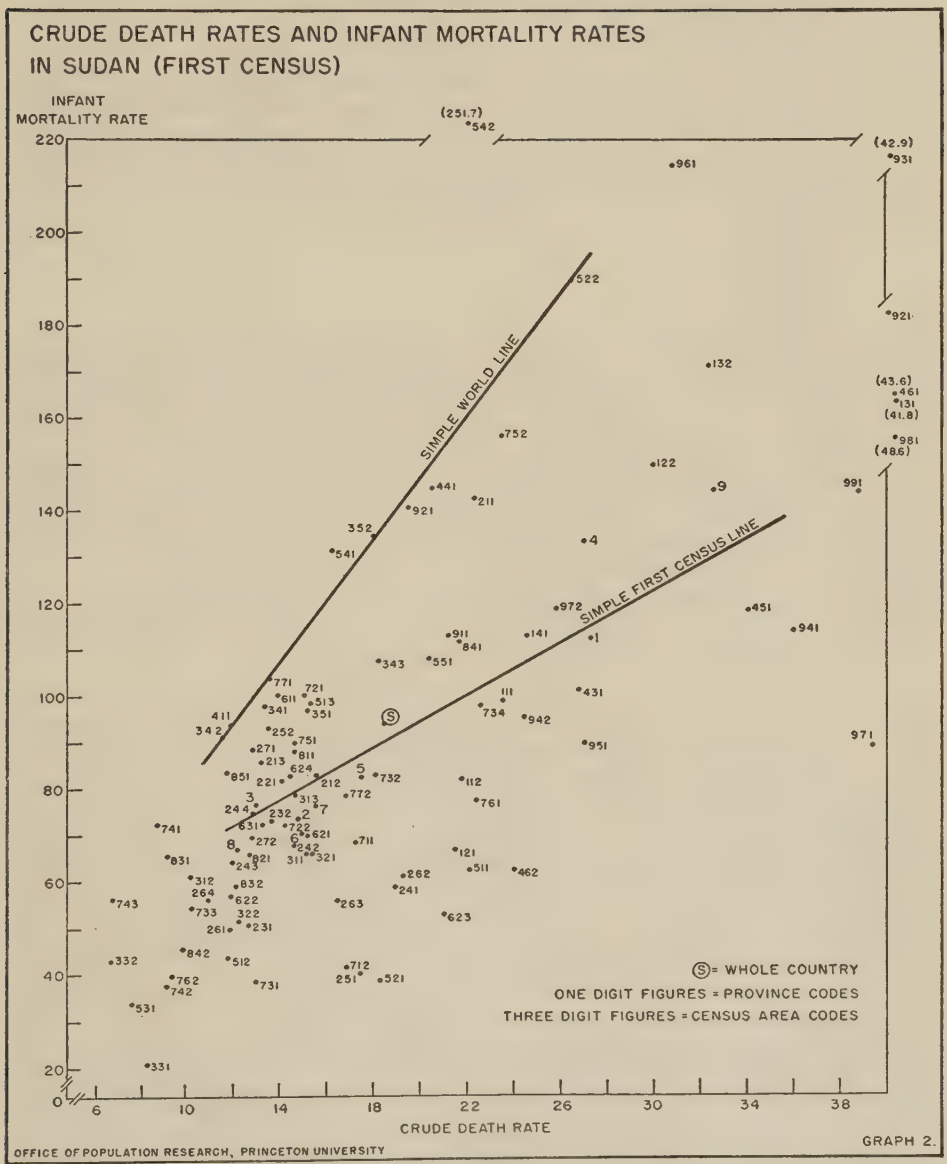
and the coefficient of correlation (r) = ·56. The areas considered are ethnically heterogeneous and of a varying degree of sophistication. When grouped into more homogeneous lots, higher coefficients of correlation are obtained, but an extensive exercise would in this connection probably be of limited interest.

This is a suitable place for a further digression on the way the information required for the computation of the IMR and the CDR has been collected in Sudan. Each head of household was asked how many persons died in his household during the preceding twelve months. He was also asked whether any members of his household died elsewhere during the last twelve months, provided the death or deaths, if more than one, did not take place in another family household, as distinct from institutional households. A set of special definitions has been designed to meet all conceivable special cases (Population Census Office, 1954, p. 61).

Each woman in the reproductive ages was asked whether any of her children died during the last twelve months while under one year of age. As already partly noted earlier both answers, apart from many other considerations, depended for their accuracy on the ability to recollect and on truthfulness. In most other countries the information is available from registration of vital events or from special, usually small-scale intensive surveys. In Sudan considerable ingenuity went into the way these questions were framed and asked. Great pains were also taken over the training of the enumerators (and particularly the female post-enumerators) on these questions. Nevertheless it must be admitted that they were only two out of some twenty. Registration, covering in Sudan, as it does, less than one fifth of vital events and spread most unevenly over the whole country is quite unsuitable for the computation of IMR and CDR.

Not only is the Simple First Census Line, over the relevant range, substantially below the Coale–Hoover Line and the Simple World Line, but it also rises less steeply (the regression coefficient or slope being only 2·8 against 6·5) with increasing CDR. This is the arithmetical confirmation of the suspicion about the Sudanese

IMR. What is more unfortunate is the low r. It throws some doubt on the validity of the whole exercise. On the other hand it is noticeable that the Province


CRUDE DEATH RATES AND INFANT MORTALITY RATES
IN SUDAN (FIRST CENSUS)
INFANT MORTALITY RATE
CRUDE DEATH RATE
SIMPLE WORLD LINE
SIMPLE FIRST CENSUS LINE
Ⓢ= WHOLE COUNTRY
ONE DIGIT FIGURES = PROVINCE CODES
THREE DIGIT FIGURES = CENSUS AREA CODES
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GRAPH 2.

dots have placed themselves much more consistently and result in a more reasonable pattern. The three Southern Provinces :

1. Bahr-el-Ghazal
4. Equatoria
9. Upper Nile

placed themselves together and far away from others, as a result of a much higher IMR and CDR. It is probably stretching the argument too far to point out that a straight line between the two Nilotic Provinces of

1. Bahr el Ghazal and
2. Upper Nile

is nearly parallel to the Simple World Line. Equatoria Province (code : 4) is too high and/or not far enough to the right. At this stage it is impossible to say which is the case. With its Sudanic and Nilo-Hamitic ethnic composition, with its more active participation in the disturbances of 1955 and with the other census results also being more erratic, this is probably not surprising. The five Provinces of

2. Blue Nile
5. Kassala
6. Khartoum
7. Kordofan
8. Northern

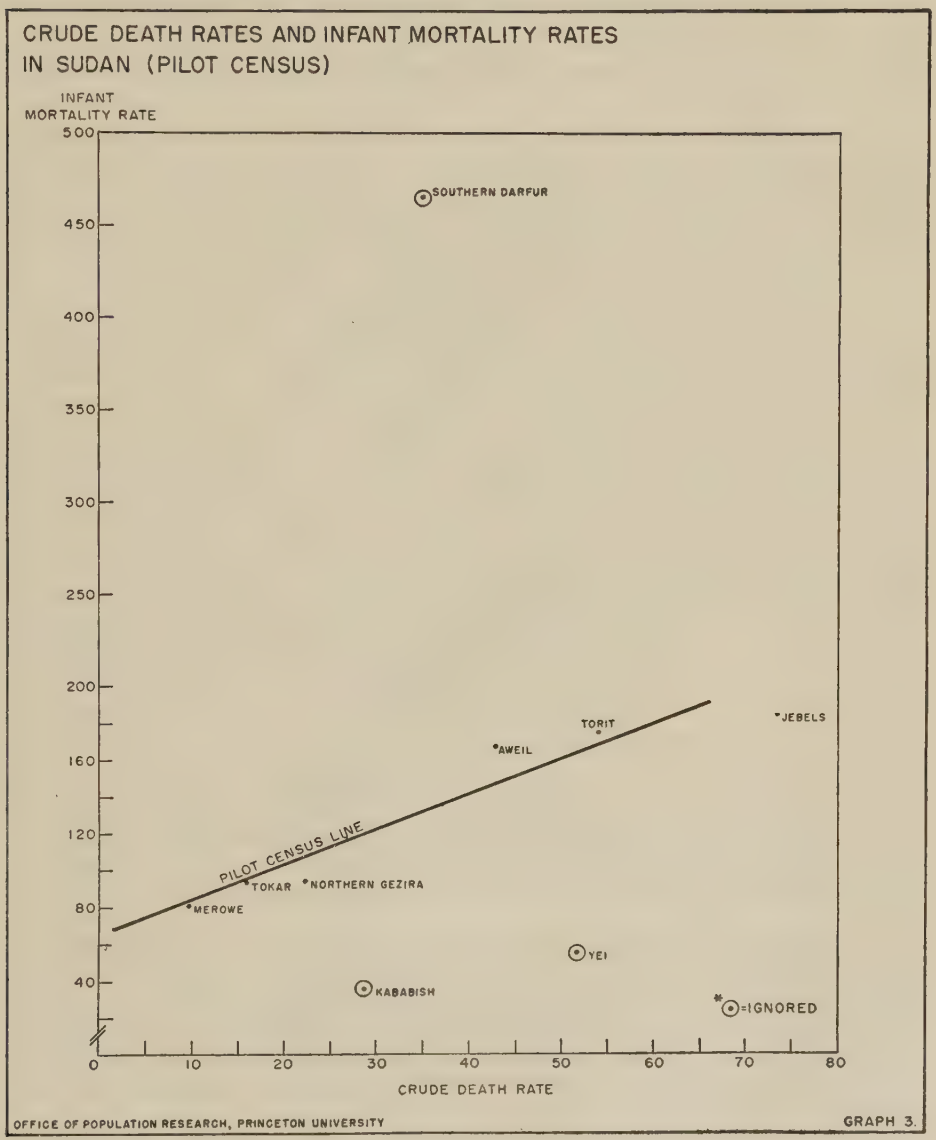
follow a nearly straight line. Darfur Province (code : 3) does not quite belong to this group, but then it has a high Negroid population proportion, has other peculiarities (see para "The tragedy of Darfur" in Krótki, 1958) and has a number of Census Areas with exceedingly low CDR. Should in these latter Census Areas the true CDR be higher, Darfur would move to the right on the graph and could possibly coincide with the nearly straight line leading from 8 through 2 and 7 to 5. When some more work has been done on the series of Sudanese figures, it is probable that the worst offenders among the more erratic Census Areas can be weeded out and provided with explanations why they behave in the different way they do.

Another comparison can be made with results of the 1953 Pilot Census. In graph 3 the results from the nine Pilot Census Areas have been plotted. Three freak Census Areas have been ignored. The remaining gave :

$$IMR = 66 + 1{\cdot}9\ (CDR)$$

and $r = {\cdot}95$. While the high r gives some confidence, it will be noticed that the Pilot Census Line is not very different from the Simple First Census Line, suggesting that on both occasions the same biases of enumeration were disturbing a similar underlying demographic situation. The very high r is not too significant, because it is influenced by the very considerable separation between the two lots of three dots each, rather than by any more direct correlation between all six dots taken together. All four lines (with three other lines to be explained below) have been brought together on graph 4. Either Sudan is different from the rest of the world or the IMR—as reported—is too low. The alternative that the CDR as reported is too high can probably be dismissed. A casual inspection of the CDR reported from Sudan suggests that the CDR are, if anything, too low rather than too high. In many people's minds a CDR of less than 10 in an underdeveloped country is plainly ridiculous. In fact, one of the rules which the First Census escaped only with the utmost difficulty was that no CDR is to be less than 12 or 11 or 10 (as the bargaining proceeded). One must not be too dogmatic in this connection, because CDR as low as 7·5 (United Nations, 1957) have been reported from areas where health conditions are not much more favourable than in Sudan (e.g. Angola, Spanish Guinea) and where the age distribution is probably as favourable to general mortality as in Sudan (e.g. Jamaica, Mexico). We conclude, therefore, that while some of the low CDR must not be dismissed outright without a further enquiry it is probably safe for the time being to accept the CDR as they are. In any case, only one thing at a time can be discussed and this paper concentrates by choice on the IMR.

Another variation on the same theme is possible by utilizing some work done by the Population Branch of the Bureau of Social Affairs of the United Nations Organization (United Nations, 1955a). There some theoretical model life tables



for underdeveloped countries have been worked out in a rather ingenious way. The results if plotted on a graph using the x-axis to show the life table death rate (or reciprocal of expectation of life at age zero $= \frac{1}{\mathring{e}_0}$) and on the y-axis mortality rate at age less than one, which for our purposes can be taken as equivalent to IMR, would

give a line of dots curving slightly downwards. In its higher regions, these dots would have been close to the Simple World Line. The same life tables could also be plotted showing on the x-axis the life table death rate for all those aged one year and more (or reciprocal of expectation of life at age one $= \frac{1}{\mathring{e}_1}$) and on the y-axis the same mortality rate as previously. This second line of dots, if plotted, would also curve downward and in its upper regions would be found in the neighbourhood of the N-IDR World Line.

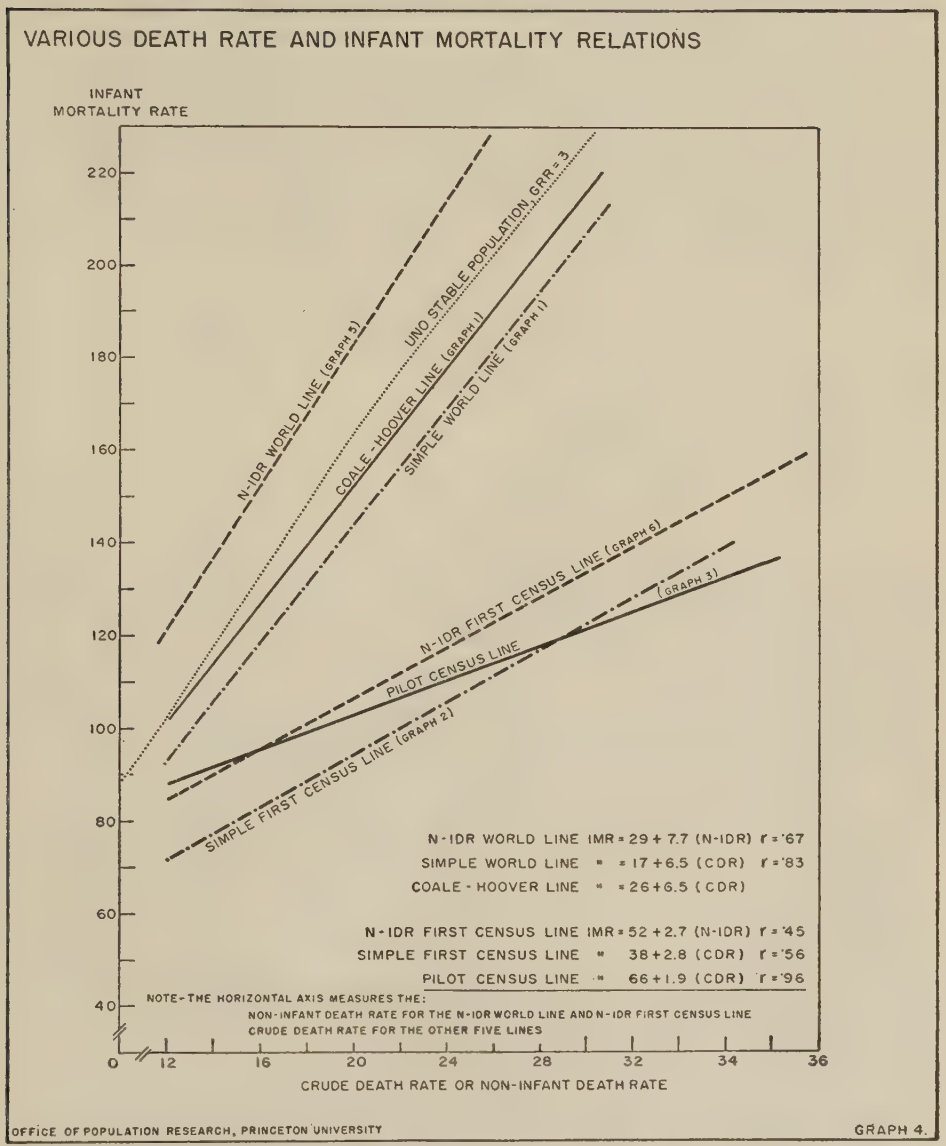
It is satisfying that both lines of dots would be in the neighbourhood of their appropriate World Lines in both cases. It is disquieting that they would be very far away from them in their lower reaches. Fortunately, there is a very good explanation. The life table relationships, as is well known, refer to what are called stationary populations, that is populations which have such schedules of fertility and mortality that they just manage to replace themselves, but no more. They neither increase nor decrease in numbers. Furthermore, in their lower reaches they refer to populations with low fertility rates (because they are stationary CDR = *CBR*), i.e. not comparable (because of different age distributions) with the other populations both in the World and in Sudan, with which we have been dealing so far. To adapt these lines of dots more to the circumstances of a country like Sudan, the results of another investigation by the Population Branch have been used (United Nations, 1958). There on pages 42 and 43 some characteristics of typical stable populations with different levels of mortality and fertility are given. For the benefit of non-demographers it must be added that a "stable population" in demographic parlance means one stably growing (or declining) at a uniform rate on account of fixed schedules of fertility and mortality and no external migration, over some period in the past. Choosing a gross reproduction rate of 3 and translating the $\mathring{e}_0$, given in the table into IMR from the other United Nations publication (United Nations, 1955a) the stable populations have been plotted somewhat roughly in graph 4. We note that the line of model life tables corrected for "stability" and using $\frac{1}{\mathring{e}_0}$ does not run away from the Simple World Line, but stays close to it. The same would be true of the model life tables using $\frac{1}{\mathring{e}_1}$. They would stay close to the N-IDR World Line if plotted as stable populations. But the graph would become even messier than it is already, so this last line has not been entered. In view of the fact that our regression lines (both the World Lines and the First Census Lines) come from stable populations rather than stationary ones, it is gratifying to note this agreement between the model life table relationships when corrected for stability.

A gross rate of reproduction of 3 has been chosen for the sake of plotting of the stable populations, because this is probably the truest rate for Sudan. A rate of 2·4 has been reported (Population Census Office, 1958, p. 60), but as will be shown in another paper, this is probably an underestimate. Again, let us admit that substantial parts of our argument are conjectural, but we cannot escape the fact of repeated consistency between the evidence—even if sometimes only shreds of evidence—we are using.

5. *Correlation with Non-Infant Death Rate*

The results of the comparison with CDR have been considered encouraging enough to proceed one step further and to undertake a more laborious exercise. The IMR has been correlated not with the CDR (which includes infant deaths), but

with Non-Infant Death Rate (called hereafter: N-IDR), which is the number of all deaths of persons aged one year or more per 1,000 persons living aged one year or more, in the case of Sudan with modifications peculiar to the enumeration techniques


VARIOUS DEATH RATE AND INFANT MORTALITY RELATIONS
INFANT MORTALITY RATE
220
200
180
160
140
120
100
80
60
40
0
12
16
20
24
28
32
34
36
N-IDR WORLD LINE (GRAPH 5)
UNO STABLE POPULATION GRR = 3
COALE-HOOVER LINE (GRAPH 1)
SIMPLE WORLD LINE (GRAPH 1)
N-IDR FIRST CENSUS LINE (GRAPH 6)
PILOT CENSUS LINE
(GRAPH 3)
SIMPLE FIRST CENSUS LINE (GRAPH 2)
N-IDR WORLD LINE IMR = 29 + 7.7 (N-IDR) r = '67
SIMPLE WORLD LINE " = 17 + 6.5 (CDR) r = '83
COALE-HOOVER LINE " = 26 + 6.5 (CDR)
N-IDR FIRST CENSUS LINE IMR = 52 + 2.7 (N-IDR) r = '45
SIMPLE FIRST CENSUS LINE " 38 + 2.8 (CDR) r = '56
PILOT CENSUS LINE " = 66 + 1.9 (CDR) r = '96
NOTE-THE HORIZONTAL AXIS MEASURES THE:
NON-INFANT DEATH RATE FOR THE N-IDR WORLD LINE AND N-IDR FIRST CENSUS LINE
CRUDE DEATH RATE FOR THE OTHER FIVE LINES
CRUDE DEATH RATE OR NON-INFANT DEATH RATE
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GRAPH 4.

employed and explained earlier. For the thirty-eight areas of high fertility we obtain a regression line of the form

$$IMR = 29 + 7{\cdot}7\ (\text{N-IDR})$$

and an $r = {\cdot}67$. The new r is lower than the r of the previous exercise which was

equal to ·83. This is no doubt due to the removal of the auto-correlation of the infant deaths of the y-axis making their contribution to the total deaths of the x-axis.

The line has been drawn in graph 5 and it can be seen that it rises faster (the regression coefficient being 7·7) than did the old Simple World Line with a coefficient of 6·5. Additionally the new World Line has a higher constant of 29 against 17 of the old Simple World Line. Let the new line be called N–IDR World Line as an abbreviation for "Non-Infant Death Rate adjusted and correlated World Line".

In order to compute the N-IDR, the number of non-infant deaths had to be obtained for the numerator and the number of people aged more than one year for the denominator. This was seldom possible for the same year for which the previously used rates have been available. The calculations have, therefore, been done on percentages, in which way the additional benefit of working in smaller figures has been reaped. The following formula has been used

$$(\text{N-IDR}) = \left[(\text{CDR}) - \frac{(\text{IMR})\ (C\!BR)}{1000}\right] \frac{100}{(\text{N-I})\,\%}$$

where: N-IDR = non-infant death rate
CDR = crude death rate
IMR = infant mortality rate
CBR = crude birth rate and
N-I % = % of persons aged one year or more (Non-Infants).

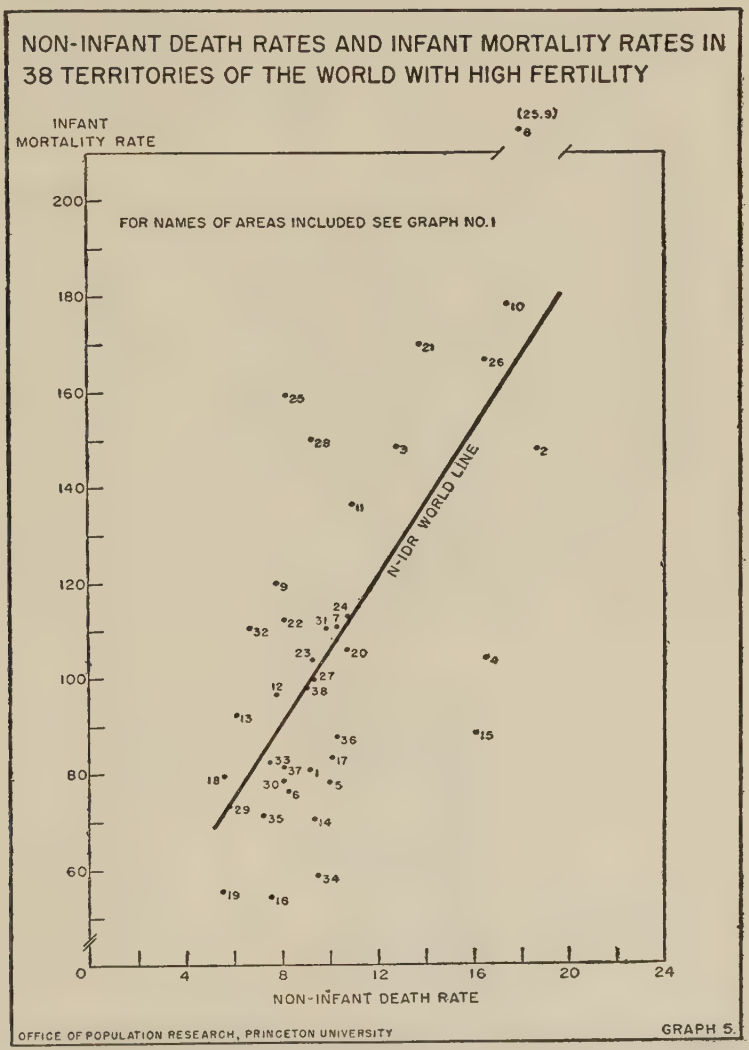
In this way at least some of the lack of comparability due to possible trend influence has probably been eliminated or reduced. For twelve of the thirty-eight territories no age distribution could be easily located. It was, therefore, assumed that the proportion of persons aged one year and more is equal to 97·1 per cent which was the unweighted average of the remaining twenty-six territories. With eight exceptions, out of those twenty-six territories, the proportions by age were available for years earlier than the mortality rates. Should there, therefore, have been an increase (or decrease) in the proportion of those aged one year and more between the years concerned, the N-IDR calculated in the above manner with a lower number of non-infants in the denominator would be an overestimate (or underestimate). It is probably more realistic to expect a decrease in the proportion of non-infants and therefore an underestimate in the N-IDR, in view of the fact that spectacular improvements in conditions of infant mortality may have taken place over the years in question. If this was the case, the correct line based on higher N-IDR would have been flatter (the N-IDR moving to the right). On this argument the steepness of the line may, at least partly, be due to this bias. It is, however, doubtful whether the infant mortality could be all that sensitive, in view of the argument by Stolnitz discussed in detail earlier. In one or two cases no ratios were available, but missing absolute figures were available elsewhere than in the Demographic Yearbooks. In such cases the ratios were computed before the beginning of the exercise. The Sudanese equivalents were also computed on relative figures, even though they all came from the same year. This has been done solely because of ease of calculation.

The line computed for Sudan and called hereafter: N-IDR First Census Line, turned out to be of the following form:

$$\text{IMR} = 52 + 2{\cdot}7\ (\text{N-IDR})$$

While there is not much difference in the slope, the N-IDR First Census Line is

flatter, if anything, than the Simple First Census Line. This difference in the influence of the N-IDR adjustment on the First Census Lines as compared with its influence on the World Lines, is another indication that the infant deaths in Sudan have been underreported and underrecorded. The removal of the self-correlation



had a similarly lowering effect on the coefficient of correlation as in the case of the World Lines, reducing it from ·56 to ·45.

There is one more comment, which can be made about the behaviour of the World Lines when compared with the First Census Lines. The latter behaved as Stolnitz would expect them to behave and an optical examination of the new distribution of dots does not suggest that a better fit could be obtained by a curved line ;

in short the inclusion or exclusion of the infant deaths does not seem to matter much in the case of Sudan. On the other hand the World Line after the removal of infant deaths from the *x*-axis becomes more volatile (rises more steeply as we move to the right), which does not yet by itself contradict Stolnitz ; but an optical examination of the distribution of the new dots suggests that if a better fitting line were drawn (an exercise which the various approximations on which this paper is based do not justify), it would start lower and curve up slightly upwards, i.e. indicate that—contrary to Stolnitz's criticism of earlier writers—IMR is a sensitive indicator of the non-infant mortality conditions. However, much more work needs to be done before a more definite contribution to this discussion could be made. In any case, it would be outside the frame of this paper.

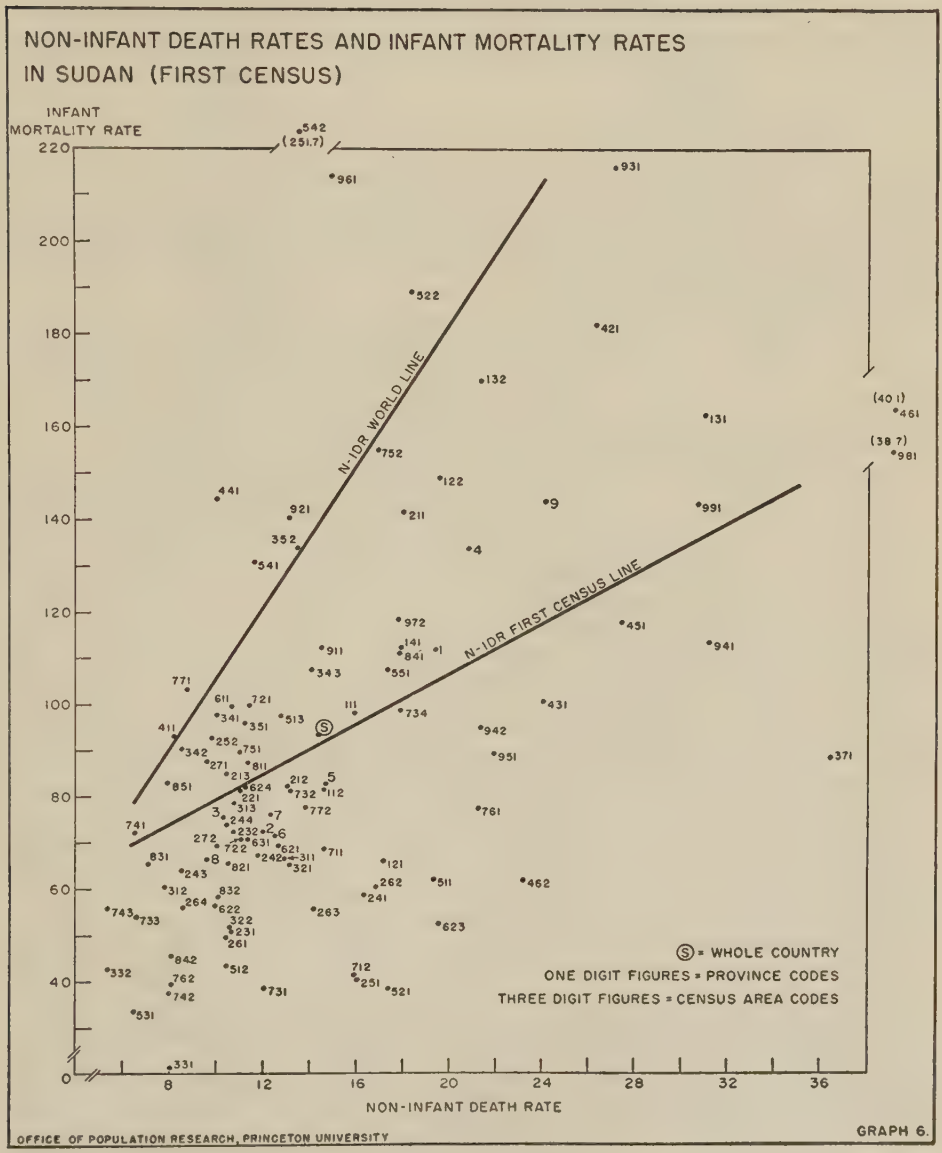
It is disturbing to our subsequent argument and particularly to the corrections applied in the appendix that the N-IDR First Census Line—at least that is the optical impression—would show no tendency to curve upwards. If we accept the curving of the World Line—and we should be reluctant to do so in view of Stolnitz's argument—then the fact that the N-IDR First Census Line does not curve up suggests that once more there is more disturbance, more irregularity, less of a pattern than in connection with the World Lines, i.e. that more complicated corrections are required than suggested by a straight line relationship. This is not surprising if we note that both the N-IDR First Census Line and the Simple First Census Line cut the y-axis substantially higher than their World Line counterparts, which in regression lines is usually an indication of lesser correlation. For one's peace of mind it would be best if the line went through the origin of the axes.

When the N-IDR World Line is drawn on graph 6, with few exceptions (could they be the ones with correct IMR ?), all Census Areas show IMR too low relatively to the N-IDR World Line assuming their N-IDR to be correct. The exceptions are (including two Census Areas below the N-IDR World Line, but very close to it) :

Census Area			
Code	Name		
342	Nyala Baggara West	x	y
352	Zalingei South East	x	y
411	Eastern Equatoria		
441	Torit		
522	Gedaref South	x	
541	Port Sudan Town	x	y
542	Suakin Town	x	
752	Tegale South	x	y
771	Mesiriya Zurg		y
921	Zeraf Valley	x	y
961	Renk	x	y

It is not easy to say at a glance what these Census Areas have in common which made them follow the pattern of the world at large. Eight of them (x) have been enumerated in winter, though the relevance of this fact to the hypothesis discussed is not apparent. Seven somewhat different Census Areas (y) have been enumerated by field personnel trained and largely supervised by what were probably the best Field Inspectors. Daniel Climenhaga, the Chief Field Inspector stayed with the writer on his way back to Canada and agreed with this impressionistic opinion. It also appears that most of the other Census Areas allotted to these Field Inspectors are

closer to the N-IDR World Line than Census Areas allotted to other Field Inspectors. However, there is no denying that this argument is highly conjectural.


NON-INFANT DEATH RATES AND INFANT MORTALITY RATES
IN SUDAN (FIRST CENSUS)
INFANT MORTALITY RATE
N-IDR WORLD LINE
N-IDR FIRST CENSUS LINE
Ⓢ = WHOLE COUNTRY
ONE DIGIT FIGURES = PROVINCE CODES
THREE DIGIT FIGURES = CENSUS AREA CODES
NON-INFANT DEATH RATE
OFFICE OF POPULATION RESEARCH, PRINCETON UNIVERSITY
GRAPH 6.

6. *Correction to Sudanese Infant Mortality Rates*

On the assumption that the relationship between the IMR and N-IDR in Sudan should be similar to that summarized in the N-IDR World Line (and the defence of this assumption at the end of this paper will be weak, as is no doubt

already obvious from the foregoing argument) the resulting IMR have been calculated and presented in the appendix taking the N-IDR as given. In the few cases where the reported IMR was higher than the calculated IMR, the reported IMR was retained. This happened in the following Census Areas :

352	Zalingei South East	542	Suakin Town
411	Eastern Equatoria	771	Mesiriya Zurg
441	Torit	921	Zeraf Valley
522	Gedaref South	961	Renk
541	Port Sudan Town		

Not unnaturally these nine Census Areas are with two exceptions the same as those eleven Census Areas which lie above or very near the N-IDR World Line shown at the end of the previous paragraph. In fact they *are* the Nine Census Areas which lie above the N-IDR World Line.

More rigorously the calculation has been done on the following assumptions :

1. the N-IDR is correct ; in more standardized demographic notation $\frac{\infty D_1}{\infty P_1}$ is correct, where ∞D_1 is equal to the number of deaths of persons aged one year and more, while ∞P_1 is the population aged one year and more ;
2. the regression line (the N-IDR World Line), over the ranges concerned, is a good approximation for Sudan of the relationship between IMR and N-IDR ;
3. all unreported and therefore unrecorded infant deaths are *all* the unreported and therefore unrecorded births, i.e. there were no other unrecorded births.

Some comments about the acceptability of assumption 1 have already been made. Some more will follow, where relevant. A longer discussion although pertinent, in fact basic to assumption 2, and to the whole thesis of this paper, would, however, be outside its deliberately limited scope.

The realism of assumption 2 has been argued throughout the length of the paper so far and subject to further work and further results it is now largely a question of temperament whether we find it reasonably acceptable or not.

The third assumption is not as unrealistic as it sounds. A comparison has been made of the number of births reported with the number of infants alive. The number of births reported has been deflated to allow for infant mortality by a straightforward subtraction. Out of the total of ninety-four Census Areas, it was found that in twenty-eight Census Areas the number of births reported (deflated by infant mortality) was different (in twenty-two Census Areas lower, in six Census Areas higher) from the number of live infants reported, by $2‰$ or more. (Smaller discrepancies do not, probably, deserve discussion.) One could possibly claim that at least in the twenty-two Census Areas with fewer births than infants, there were other unrecorded births and dismiss assumption 3 as unrealistic. But firstly, with the very high birth rate already reported one should be reluctant to suggest that births were undereported whatever the experience of enumeration in other territories. Secondly and more specifically, Census Areas under suspicion do not correlate with the degree of correction resulting from the similarity-to-World-Line reasoning. The thought, therefore, that underreporting of births has been correlated with underreporting of infant deaths can be dismissed. Nor has underreporting of births caused (being the denominator) a too high IMR. The discrepancies and corrections are random. A detailed report must await another occasion. For the present needs it must suffice

to say that the agreement between births reported (after deflation for infant mortality) and number of infants alive was exceedingly close.

A further argument will make this clearer. The number of infants was greater (or smaller) than the number of births reported, after a due allowance for infant mortality, by more than 3‰ points in the following Census Areas :

		‰		
112	Aweil West	3·3		
132	Rumbek	(–5·3)	x)	
141	Western Bahr el Ghazal	4·2	x)	
211	Ed Dueim North East	3·9	x)	xx)
212	Ed Dueim South East	8·9	x)	xx)
241	El Kamlin	(–3·3)		
411	Eastern Equatoria	4·3	x)	xx)
461	Zande East	3·3	x)	xx)
721	Gawama'a East	3·5	x)	xx)
941	Malakal District excluding Malakal town	11·3	x)	
971	Western Nuer Ghazal	3·9	x)	
972	Western Nuer Jebel	4·0		

These discrepancies are diminutive, but in so far as they exist, and ignoring for the time being Census Areas 132 and 241, they can mean either that :

1. too many live infants have been enumerated, or
2. too few births were reported, or
3. too many infant deaths were reported
4. that some of the older children have been included in the youngest category ; or naturally a combination of all or some of the four alternatives may have taken place.

The first alternative is a physical near-impossibility (though nothing is really impossible during a field enumeration) in so far as live babies had to be produced, as a rule, to be enumerated. Once more, it is not possible to introduce into this discussion the fact that some age-groups were raised as a result of the Post-Enumeration Survey, however pertinent it may be. Suffice it to say, that a cursory examination of the relevant figures does not suggest that an answer lies in this direction. In any case, any census-taker or theoretical demographer will suggest that as a rule infants are underenumerated rather than overenumerated. Though recently, even this long cherished belief has been shattered when it was found that it is whole families with infants which somehow fall through the enumeration net (Coale, 1955). In our case, the relevant consideration is that the respective infant would be missed and not reported twice, so we need take no sides in this discussion.

The second alternative is discussed below. The third alternative cannot really be realistically entertained (that too many infant deaths have been reported) in the light of the foregoing discussion of this whole paper. The overwhelming feeling should by now be—it is hoped—that too few infant deaths have been reported.

The fourth alternative is a real possibility, but must also be dismissed for the time being, at least from this paper. It would involve a very lengthy discussion of the age-structure of all Census Areas concerned.

To return to the second alternative, the suggestion that too few births have been reported could possibly be true in the case of Census Areas asterisked, which have *CBR* below the Province rate (x) or even below the whole country average (xx). It could not very well be an adequate explanation in the case of 112 Aweil West and

972 Western Nuer Jebel where the rates are pretty close to any theoretically imaginable maximum physiological reproductive capacity and somewhat above the probably classical case of the Hutterite women (Tietze, 1957), a religious group in the U.S.A. and Canada with high health standards and no restraints on reproduction, which is often quoted as a well-documented case approaching maximum physiological procreation. The Hutterites on account of their very high health standards could be expected to have higher fertility than Sudan. We could quote examples of very high fertility all over the world, even in relatively sophisticated communities, like the French Canadians with reported C*B*R around 65. Nevertheless, 16,000 births could not be produced by 25,000 females of child-bearing ages year in, year out (as allegedly happened in 112 Aweil West). Either the year was exceptional or the figure is too high. (When reference is made to the appendix any C*B*R higher than 75 can probably be treated as a physiological impossibility, but it remains for a further enquiry to determine whether it is possible to say that too many births have been reported or whether the explanation lies elsewhere.)

The two cases with negative discrepancies in the above list are logically easier to explain away. Perhaps the infants were underenumerated. Perhaps the high birth rates reported in the two cases are too high. In any case, the outcome of the discussion of all Census Areas seems to be that while the birth rates may be wrong and/or the number of infants enumerated may be wrong, the likely wrongness is in the direction, which when corrected would make assumption 3 more, rather than less, acceptable.

We start thus on the basis of three assumptions, which, although far-reaching, are for the present purposes neither artificial nor disturbing. Let then the regression line be :

$$\text{IMR} = \cdot 029 + 7 \cdot 7 \text{ (N-IDR) and let}$$

D_0 stand for all infant deaths
D_o^r „ „ recorded infant deaths
D_o^u „ „ unrecorded infant deaths
B „ „ all births
B^r „ „ recorded births
B^u „ „ unrecorded births

then tautologically $D_0 = D_o^r + D_o^u$ and
$B = B^r + B^u$

by assumption 3 $D_o^u - B^u$

$$\therefore B = B^r + D_o^u$$

Then by definition $$\text{IMR} = \frac{D_0}{B}$$

or by substitution $$\text{IMR} = \frac{D_o^r + D_o^u}{B^r + D_o^u}$$

or $$D_o^r + D_o^u = \text{IMR } (B^r + D_o^u)$$

which gives by transformation

$$D_o^u - \frac{(\text{IMR})\ B^r - D_o^r}{1 - (\text{IMR})}$$

(It will be noted that the above symbols refer to rates per one person and per one birth, i.e. are in the form of decimal points, not having been multiplied by the conventional 1000.)

On the above assumptions and using the above formula the number of infant deaths unrecorded has been computed for each Census Area ; the Province figures and the whole country total have been arrived at by addition. The detailed results in the form of new IMR are given in the appendix. On this basis it appears that some 36,000 more babies have died in the year prior to the enumeration while aged less than one year, that is more than recorded, giving for the whole country an IMR of 140 as against the census rate of 94. Even 140 would be considered by any demographer with a knowledge of Sudan, too low, but then the N-IDR is also under some suspicion. And a higher N-IDR would have to be followed by a higher IMR so long as we base ourselves on the N-IDR World Line.

When some of the international estimates (United Nations, 1955) are considered and when the built-in underestimating bias of our calculation method are taken into account, a figure around 200 suggests itself. The source of bias is the possibility that the N-IDR World Line is too low and too flat because of under-registration of infant deaths in the thirty-eight territories used, coupled with the possibility that it should be curving upwards. An IMR of 200 would mean that every fifth Sudanese baby dies within a year of being born. Many a health worker in Sudan would be surprised at the suggestion that *only* every fifth child dies. Conversationally they usually tend to suggest much higher figures.

Before we consider where this exercise has brought us to, we must deal with two side-issues, one of which is rather awkward for our exercise. As stated above, equating the ninety-four Census Areas to the N-IDR World Line experience has shown that 36,000 more babies must have died. Now, these 36,000 babies in order to make their contribution to the IMR must also have been born. Although born, they have not been reported. The already partly explained enumeration procedure was such that a baby born had to be accounted for either by being reported as a live baby or as a baby which has died in the meantime. An opposite agreement, namely that a live infant had to be reported as born (unless his mother had died since the birth) was also required. This procedure was largely successful as is apparent from the comparison of births and infants mentioned earlier. The 36,000 are in neither of these categories. If we add them to the number of births reported during the enumeration we arrive at a higher birth rate. This Infant-Mortality-corrected Crude Birth Rate (called hereafter : IMcC*B*R) is shown together with the C*B*R in the appendix for all the areas of the country. Due to this procedure the C*B*R for Sudan as a whole which was 51·7 increased to an IMcC*B*R of 55·2. The 36,000 babies being only 7 per cent of the births reported made a small change in the IMcC*B*R. Unfortunately having increased the number of births, they increase at the same time the denominator of the IMR and consequently decrease the IMR, which once more is out of step with the N-IDR, according to the N-IDR World Line relationship. In fact the exercise should have been done as a compound interest exercise. However, the gain in accuracy in comparison with the other assumptions used (including the assumptions of "even flow" and "no trend") would be trivial. In fact there is some suspicion that the number of births itself in some areas is an underestimate in spite of the very high IMcC*B*R already commented upon. The suspicion arises out of the impression already discussed that the number of children under one year of age seems to be in some areas higher than the number of recorded births (even if deflated by infant mortality), quite apart from

the fact that the number of children under one year of age appears (again : impressionistically so far) to be on the low side in comparison with those aged one year and over to under five. If then, the number of births has been underreported, the denominator of the IMR is too small, in which case the ratio, namely the IMR is too high. The true IMR, that is true as far as the number of births is concerned, is smaller, but the N-IDR World Line calls for a higher not a lower rate, that is higher through a larger number of infant deaths, which is possible in the circumstances of Sudan or a lower number of births which is not very possible in view of the existence of the live infants found and recorded. However, details of this discussion must also be left to another exercise, particularly as reasoning on those lines would soon find us in the region of 300 and 400 IMR, which many a demographer would consider for a country like Sudan, a realistic possibility.

The second, though less awkward aspect is the fact that the "discovered" 36,000 babies must be added to the number of persons of all ages who died during the twelve months before the enumeration. This is essential for the computation of a consistent CDR, though it will not, of course affect the N-IDR. The detailed results are again shown in the appendix. For the whole country the CDR of 18·5 increases to a new CDR (let it be called by analogy : IMcCDR) of 22·0.

The babies added being some 19 per cent of the number of deaths reported have a greater effect on the IMcCDR than on the IMcC*B*R. The higher IMcCDR (i.e. the shift to the right on graph 2, but not on graph 6) would have required a consequent increase in the IMR, as long as we based our reasoning on the Simple World Line, but not if we based ourselves, as we did, on the N-IDR World Line. The snow-ball effect of a gradually diminishing magnitude which we had to admit (and dismiss) in the case of IMR being lowered every time the IMcC*B*R increased, does not worry us in this case, because we deal with the N-IDR and not with the CDR, or even IMcCDR.

It is probable that some of the figures in the appendix are but slight improvements on the unadjusted census figures. Readers who have their suspicions about low CDR in some of the Census Areas and who consequently suspect the N-IDR as well, but who nevertheless agree with the general outline of the argument of this paper will no doubt suspect also the suggested IMR. All they need to do is to decide by how much the N-IDR is too low, multiply this figure (that is the difference, not "their" N-IDR, which appears to them more reasonable) by about 7 and add the result to the IMR suggested in the appendix. It is possible that this small calculation will land them somewhere nearer the truth than either the census figure or the adjusted figure for IMR. They must then also remember that any such correction must also be applied to the CDR and C*B*R, the arithmetic being somewhat more involved. In most Census Areas and for most matters of broad conclusions the appendix should be considered an improvement on the census series.

To facilitate such alternative exercises a column has been added to the appendix giving the N-IDR as collected during the census. Readers will keep in their minds the fact that N-IDR must be lower than any relevant CDR, i.e. including any exceptional CDR considered "reasonable" for any area, because the N-IDR has been freed of the infant deaths and although it has also been computed after the exclusion from the denominator of the total number of infants, speaking roughly the IMR being higher than the CDR, the N-IDR must be lower than the CDR, the CDR being a kind of average between the two.

In due course other corrections to the IMR (or for that matter to other figures and ratios from the Census) may become possible and will be reported. The

important thing for users of Sudanese statistics is to remember that no figure is final, neither in Sudan nor elsewhere (where sometimes millions of people have been omitted). Each series of figures has around it a band of possible errors ; the further away from the figure, the smaller the possibility of an error being as large as the distance from the figure. Sudan is not exceptional in this respect. It would only be exceptional, if the possible size and direction of errors were not discussed and no attempt were made to assess more precisely the possible margin of error.

7. *Tribal and mode-of-living mapping*

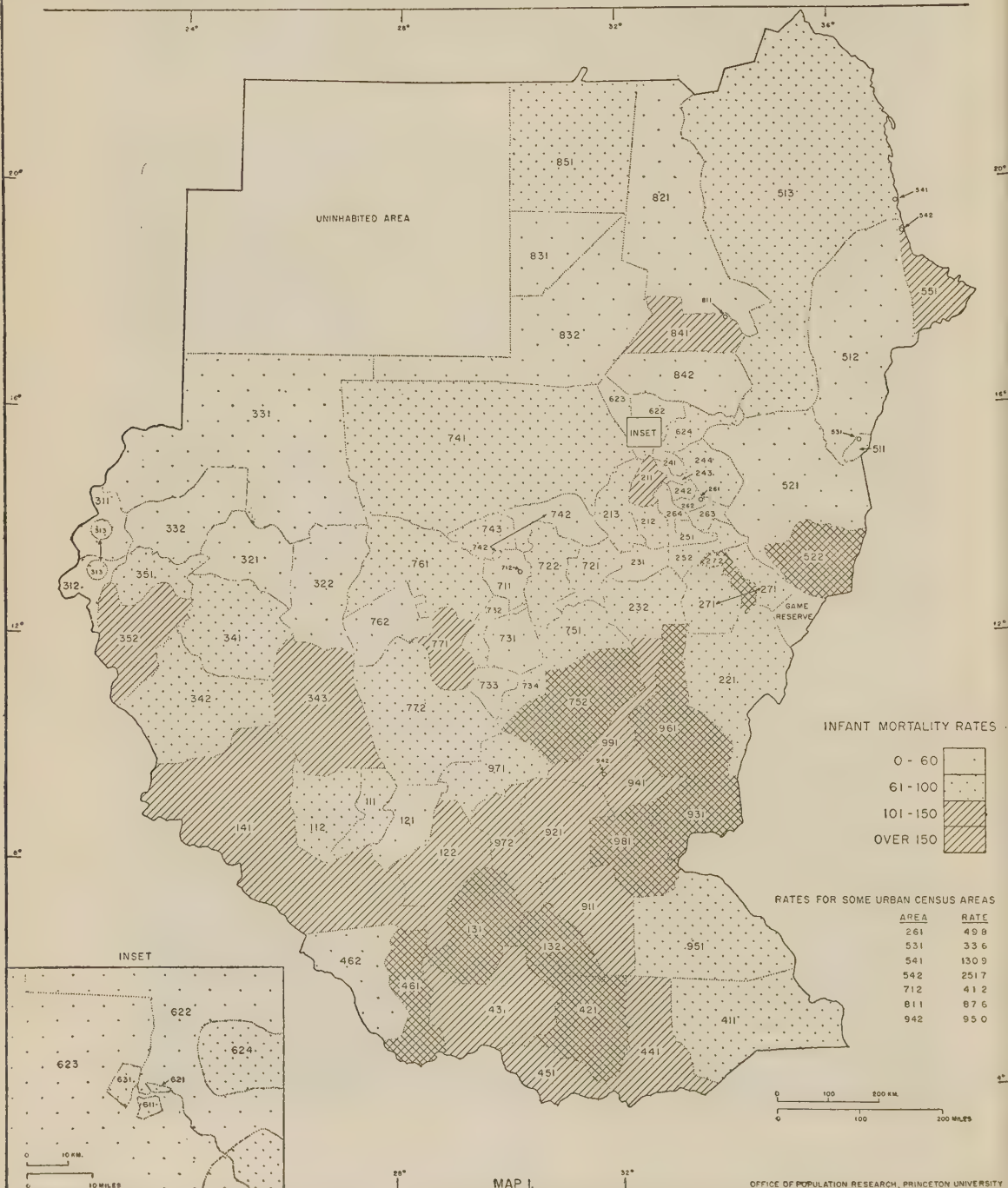
Map 1 shows the infant mortality rates as collected during the enumeration. It is impossible to discern any semblance of a pattern. The various rates are widely scattered all over the country. E.g., the two sister Census Areas 461 and 462 inhabited by the same Azande (sing. : Zande) fall into two extreme categories. Census area 121 Jur River North makes a white (low infant mortality) island in the otherwise dark (high infant mortality) South. The extraordinarily healthy belt in the East (511 Kassala Rural, 512 Hadendowa, 521 Gedaref North) must raise the eyebrows of anyone who travelled in this dry, waterless area in the winter and the impassable, difficult to traverse by motor-transport, water-logged, vast expanses in the summer. There are other surprising features on this map. Nor are they adequately explained on map 2. Further enquiry into their reliability or otherwise may resolve whether they should or should not be accepted.

On map 2 the infant mortality has been plotted as corrected according to the N-IDR World Line. The South presents now an almost solid dark block of high infant mortality. The outstanding exception is Census Area 411 Eastern Equatoria. There is little familiarity with this remote corner, but it is most unlikely that the unruly and extremely primitive Toposa and Boya could have such a low infant mortality. It is more likely that this is a freak of the enumeration. In the course of field work in this Census Area four Northern officials of the Population Census Office lost their lives. By that time somewhat more than two-thirds of the field work had been completed. When the area was pacified it proved possible to recover practically all the questionnaire books. The sample obtained has, thus, not only a higher sampling error, than it would have, if the area were enumerated as planned, but it cannot very well be claimed that it is a probabilistic sample on account of its peculiar "selection". Additionally the area is known for its notoriously suspicious attitude towards strangers, particularly inquisitive strangers. It is therefore most probable that non-infant deaths are unreliable, and consequently give us a wrong calculated infant death rate (IMcIMR).

The eastern part looks also much more uniform after the correction and is more in line with the impression it creates on all those who have some acquaintance with it. The darkening of the Gezira Census Areas (the longitudinal belt of Census Areas, the codes of which all start with 2, South of Khartoum) must cause some surprise. It is richer and has probably more medical services than other Census Areas. On the other hand it is crowded, with rather insignificant exceptions has no piped water, uses for drinking the very slowly flowing—if at all flowing and not stagnant—water in irrigation channels, has a high proportion of exogenous migrant workers, often subject to some exploitation (Hassoun, 1952) and whose standards of health are much below what the riches and sophistication of the area would otherwise suggest. Ethnically it is composed of a mixture of tribes, the impression created being rather of flotsam and jetsam of the society, than of proud, "salt-of-the-earth" farmers, running their lives with strong social coherence. The often laudable aspects of

FIRST POPULATION CENSUS OF SUDAN 1955/1956

INFANT MORTALITY RATES IN SUDAN BEFORE INFANT-MORTALITY-CORRECTION



MAP I.

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increasing sophistication and riches, do, however, also show themselves in rapidly increasing consumption of European-type alcoholic drinks and idleness. In short, admittedly the dark patch in the rich Gezira looks queer, but do not let us dismiss it unless proof to that effect is found.

The sharp discrepancy between 761 Hamar North and East and 762 Hamar South and West and the less sharply emerging difference between 841 Ed Damer and 842 Shendi can not be easily explained. The town of En Nahud is too small a proportion of 762 to bring down the rate for the whole Census Area. In any case, there is no reason to think that En Nahud is all that healthy. Could the discrepancies be due to the tabulators striking totals for infant deaths long after cards for 761 and 841 respectively have passed, substantial parts of 762 and 842 having been added to 761 and 841 respectively. The difference between 342 Nyala Baggara West and 343 Nyala Baggara East is also somewhat embarrassing.

There are many other interesting—and disturbing—questions arising, e.g. could the nomadic belt in the North-West really be all that healthy, but wider discussion would be beyond the scope of this paper.

8. *Implications of higher rates of infant mortality*

We have said earlier that for most matters of broad conclusions the figures given in the appendix should be considered an improvement on the census series.

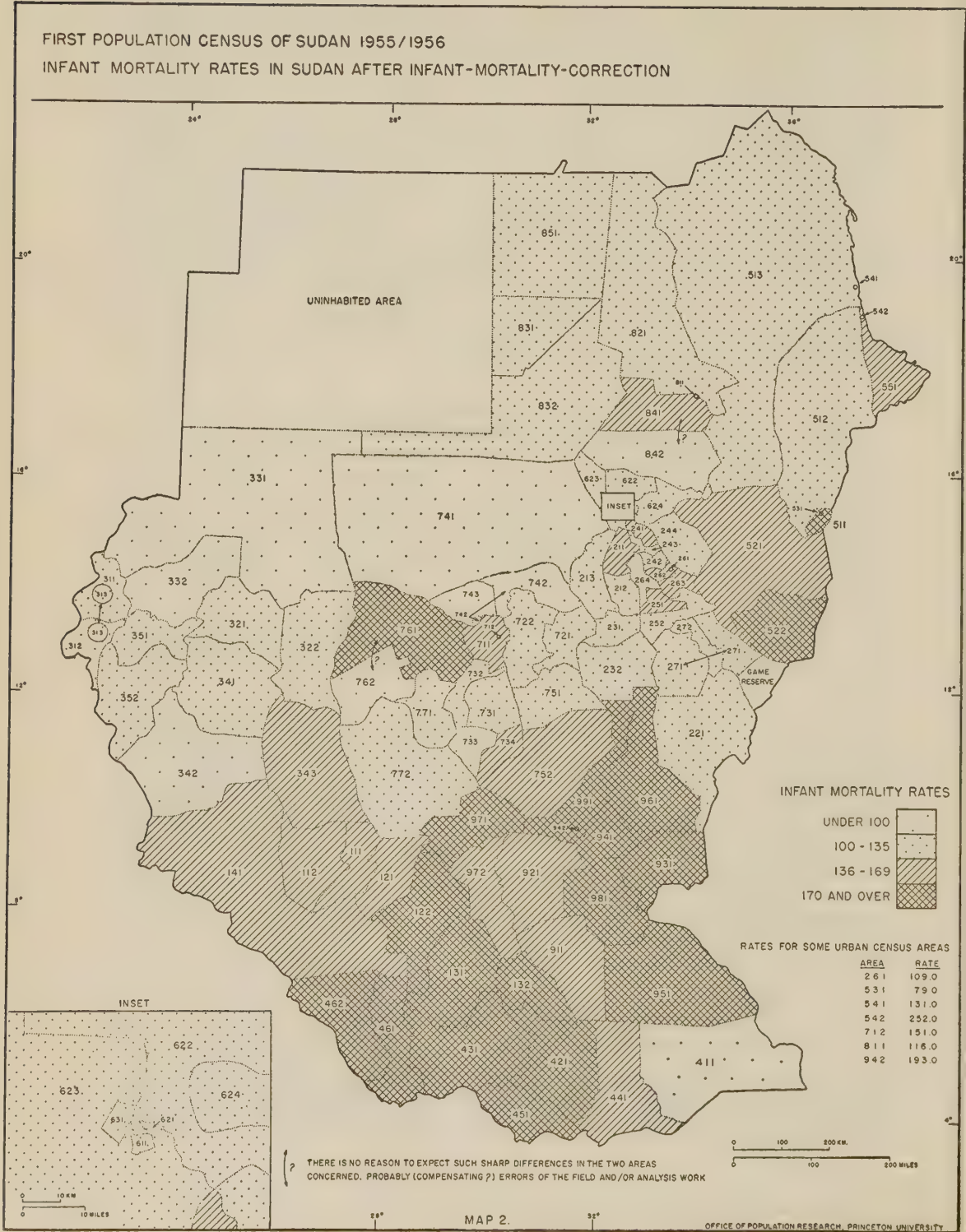
What are the conclusions ? If there is any validity in the above exercise, even more babies are born in Sudan and even more babies die, than had been reported during the enumeration. The actual figures when totals are compared are not strikingly different. Not 531,000 babies were born, but 567,000. Not 50,000 of them died but 86,000. But the implications for public thinking and public policy are severe.

There is even more waste every year than the census suggested and even the lower census figures were revelations. There are more little Sudanese to be saved every year. To be clothed, fed, taught, provided with land, water and employment when they are saved and then grow up.

The 3 per cent of annual growth suggested by the unadjusted census figures needs a lot of looking into before it can be accepted, but the present exercise provides it with a measure of reinforcement and discloses even greater potentialities hidden behind it. The natural increase percentage being the net outcome of two figures (births and deaths), both subject to corrections, it is impossible to say in advance which way on balance the corrected natural figure will change. Generally if IMR receives an upward correction (or for that matter a downward correction), then the difference between the C*B*R and CDR, i.e. the natural increase will not change if we correct the IMR and then proceed to correct the C*B*R and CDR by the same absolute figure. Even though relatively the CDR is increased more than the C*B*R, the absolute addition to both being the same, the net difference, i.e. the natural increase remains the same. All that happens is that instead of

C*BR*	CDR	Natural Increase
51·7‰	— 18·5‰	= 33·2‰ for the whole country, we have
55·2‰	— 22·0‰	= 33·2‰

The importance of the change lies in the fact that it suggests an even higher population potential in the high C*B*R, while in the higher CDR it gives an even wider scope for the play of effective, cheaply acquired, modern, nearly mechanistic,


FIRST POPULATION CENSUS OF SUDAN 1955/1956
INFANT MORTALITY RATES IN SUDAN AFTER INFANT-MORTALITY-CORRECTION
UNINHABITED AREA
INSET
GAME RESERVE
INFANT MORTALITY RATES
UNDER 100
100 - 135
136 - 169
170 AND OVER
RATES FOR SOME URBAN CENSUS AREAS
AREA RATE
261 109.0
531 79.0
541 131.0
542 252.0
712 151.0
811 116.0
942 193.0
INSET
THERE IS NO REASON TO EXPECT SUCH SHARP DIFFERENCES IN THE TWO AREAS CONCERNED. PROBABLY (COMPENSATING ?) ERRORS OF THE FIELD AND/OR ANALYSIS WORK
MAP 2.
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methods of improving health conditions. We are all against death and there is no reason why the outstanding improvements over very short periods of time elsewhere, should not be repeated in Sudan. But by the same token there is no reason to think that the CBR will be lowered in anything like the same period of time or to the same extent as the CDR. There is thus a tremendous increase of population in store for the country.

The empty spaces of Sudan and the masses of water tumbling through the deserts along the few rivers *are* matched, *can be* matched by people. But the magnitude of the population problem reveals itself in all its entirety as graver and more serious than public thinking, such as it was, was prepared to admit. The correction suggested may be small in magnitude, but all economic thinking, including problems of economic development in Sudan, are marginal. On the margin the correction suggested is large. Its potential effect on economic plans cannot from now on be ignored.

Is there validity in this exercise? It is consistent with other countries. It is consistent internally. It is consistent with other figures so far analysed. More consistency is confidently expected, when other aspects of the First Census are analysed. The present enquiry has been undertaken in spite of the warning from an authoritative source (United Nations, 1955b, pp. 22–3), that "it is impossible . . . to assign any specific value to the infant mortality rate which should accompany a given crude death rate". It is hoped that the body of evidence and reasoning assembled here will at least modify this unequivocal advice, in spite of the fact that frequently in the course of the argument, the qualifications overwhelmed the more positive parts of it. Only further analysis can reveal additional evidence or lack of it. Most of all, field surveys are required. Not massive expensive undertakings which are swamped under tons of paper or peter out on financial grounds, so that not enough money is left to publish a report. And without a printed report, even the best enquiry is more than useless. What could be more useful is a series of intensive small surveys. Best, probabilistic random samples, not fleeting visits by so-called "experts". To anybody prepared to do some humble ground-work, may I suggest areas which may be particularly rewarding (even if the results make me blush more than others):

131	Rumbek	Why should it be so very much worse than the rest of Bahr el Ghazal Province?
312	Dar Masalit South	All three are suspiciously healthy.
331	Kutum East	
332	Kutum Centre	
411	Eastern Equatoria	Probably too tough an assignment for any survey organization.
531	Kassala	Should be easy and cheap to arrange; in fact the P.M.O.H. could do it as a side line, provided he would arrange for a strict observance of all demographic statistical and survey requirements.
741	Dar Kababish	All four have CDR below 10; healthy life in dry desert? Very favourable age-distribution?
742	Dar Hamid East	
743	Dar Hamid West	
762	Hamar South and West	
931	Eastern Nuer	Difficult to think why it should be so very different from other Nuer areas.

951	Pibor	Provided both Murle and Anuak are included, so that comparability of results may be secured with the whole Census Area ; incidentally the "myth" of Murle infertility could be further investigated.

The following Census Areas, though suspect, do not deserve any immediate enquiry for the reasons stated :

264	Managil	The cotton extension must have played havoc with the census population ; the age and sex distribution of the new population must also be peculiar.
542	Suakin Town	Too small.
831	Dongola	Although CDR are below 10 the likelihood that it is not very far from the true figure is high when the general impressions the areas make are considered ; furthermore being tribally and in their masculinity ratio peculiar the results would not provide any indications for other areas of the country.
842	Shendi	
891	Lau Nuer	There was a C.S.M. epidemic at the time of the enumeration and any new results could not be compared with the census figures.

9. *Assumptions summarized*

The belief in the efficacy and applicability of the N-IDR World Line to the circumstances of the First Census is largely an act of faith. Let us add : reasonably justified faith. It may be helpful and convenient for the easier assessment of the thesis of this paper if the various assumptions and simplifications of this paper are brought together in the order in which they occur :

1. infanticide and undue exposure ignored,
2. one-year results taken as representative,
3. small size figures taken at face value,
4. sampling errors not discussed,
5. no use made of the possibility of obtaining higher coefficients when material grouped more homogeneously,
6. low N-IDR taken at face value,
7. Stolnitz's discussion not elaborated,
8. the possibility of the World Lines curving upwards ignored,
9. possibility of underreported births increasing IMR ignored,
10. influence of Post-Enumeration Survey in disturbing age-distribution not considered,
11. possibility of older children included in the infant group not considered ; nor has the alternative been discussed,
12. the "compound interest" part of the exercise increasing CBR every time IMcIMR increases, and *vice versa* not carried out,
13. disturbing features on map 1 and 2 not fully considered.

It is only when all these and several other aspects of the problem are fully considered that a more definitive answer can be given. But at least one person will be very surprised if the final answer is materially different from that suggested in this paper.

10. *Summary*

Sudan's relative good showing in infant mortality when compared with the overall crude death rates is noted. Reasons are advanced why the true infant mortality is probably much higher. After some (admittedly conjectural) calculations a minimum figure of 140 babies dying out of each 1000 born is suggested against the 94 reported from the census enumeration. In fact the real figure may be of the order of 200, i.e. every fifth baby dies within a year of being born.

The implications for public policy are grave. The task of the health programme reveals itself to be greater than anticipated. If successful, the non-productive, or at least not immediately productive, claims on the capital and human resources, which would otherwise be directed to productive development are bound to be larger than planners at present realize. Thus, the importance of a population policy at this early stage as an integral part of public attitude is stressed.

Policy should be based on correct information. Some suggestions are made about further work in the field.

11. *Acknowledgment*

This paper has been written—as a part-time task—at the Office of Population Research of the Princeton University. It would have been a very different paper, but for the very extensive advice received from the Director of the Office, Professor Dr Frank W. Notestein.

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APPENDIX

PROVINCE Census Area		Infant Mortality		Births		Deaths		
Name	Code	IMR	IMc IMR	CBR	IMc CBR	CDR	IMc CDR	N-IDR
SUDAN		93·6	140·0	51·7	55·2	18·5	22·0	14·4
BAHR-EL-GHAZAL	1 - -	111·8	178·0	84·6	91·2	27·3	33·9	19·3
Aweil East	111	98·3	151·0	90·7	96·3	23·5	29·1	15·9
Aweil West	112	81·6	141·0	106·5	113·8	21·8	29·2	14·6
Jur River North	121	66·4	161·0	87·0	96·8	21·5	31·3	17·1
Jur River South	122	149·2	179·0	78·2	81·1	29·9	32·7	19·5
Rumbek	131	162·9	268·0	79·2	90·5	41·8	53·1	31·0
Yirol	132	170·1	183·0	72·7	74·7	32·4	34·5	21·3
Western Bahr El Ghazal	141	112·4	167·0	69·3	73·9	24·5	29·0	17·9
BLUE NILE	2 - -	72·2	121·0	45·7	48·2	14·7	17·2	11·9
Ed Dueim North East	211	141·8	168·0	34·7	35·8	22·3	23·4	18·0
Ed Dueim South East	212	82·3	129·0	37·9	39·9	15·5	17·6	13·0
Ed Dueim West	213	85·1	109·0	38·1	39·1	13·2	14·2	10·4
Southern Fung	221	81·5	114·0	42·7	44·3	14·1	15·7	11·0
Kosti North	231	50·7	111·0	50·1	53·5	12·6	16·0	10·6
Kosti South	232	72·4	111·0	48·0	50·0	13·7	15·8	10·7
El Kamlin	241	58·7	155·0	57·4	63·9	18·9	25·4	16·3
El Mesellemiya	242	67·4	119·0	52·1	55·2	14·6	17·7	11·7
Halawiyin	243	64·2	94·0	62·3	64·3	12·0	14·1	8·5
Rufa'a	244	74·2	109·0	37·2	38·6	12·8	14·3	10·4
Wad El Haddad	251	40·2	152·0	53·5	60·6	17·3	24·4	16·0
Sennar & Kawahla	252	92·6	104·0	44·6	45·2	13·5	14·1	9·8
Wad Medani Town	261	49·8	109·0	36·2	38·6	11·8	14·2	10·4
El Madina	262	60·2	158·0	53·3	59·5	19·2	25·4	16·8
El Hosh	263	55·7	138·0	53·3	58·4	16·4	21·5	14·1
Manaqil	264	56·1	94·0	49·9	52·0	10·9	13·0	8·5
Fung Nazirates	271	87·9	103·0	40·6	41·3	12·8	13·5	9·6
Northern Fung	272	69·2	106·0	46·8	48·8	12·8	14·8	10·0

Province Census Area		Infant Mortality		Births		Deaths		
Name	Code	IMR	IMc IMR	CBR	IMc CBR	CDR	IMc CDR	N-IDR
DARFUR	3 - -	75·0	108·0	41·8	43·3	13·0	14·5	10·3
Dar Masalit North	311	66·8	127·0	43·0	46·0	15·1	18·1	12·7
Dar Masalit South	312	60·6	89·0	44·0	45·4	10·2	11·6	7·8
Dar Masalit "Non Voters"	313	78·6	112·0	57·7	59·8	14·6	16·8	10·7
Central Darfur	321	65·6	130·0	41·3	44·4	15·3	18·4	13·1
Eastern Darfur	322	54·3	110·0	42·5	45·3	12·3	15·1	10·5
Kutum East	331	21·3	91·0	42·6	45·9	8·6	11·9	8·0
Kutum Centre	332	42·9	69·0	42·9	44·1	6·8	8·0	5·2
Nyala Magdumate	341	97·6	106·0	37·7	38·1	13·4	13·7	10.0
Nyala Baggara West	342	90·1	94·0	37·0	37·2	11·5	11·7	8·5
Nyala Baggara East	343	107·3	138·0	44·2	45·8	18·2	19·7	14·1
Zalingei North West	351	96·4	115·0	46·8	47·6	15·2	16·0	11·2
Zalingei South East	352	133·9	134·0	36·4	36·4	18·0	18·0	13·5
EQUATORIA	4 - -	132·9	189·0	54·1	58·4	27·0	31·3	20·8
Eastern Equatoria	411	93·1	93·0	43·7	43·7	11·9	11·9	8·2
Juba	421	182·5	232·0	85·9	91·5	40·1	45·6	26·3
Moru	431	100·6	214·0	35·3	40·4	26·8	35·5	24·0
Torit	441	144·6	145·0	77·4	77·4	20·5	20·5	10·0
Yei	451	117·9	240·0	71·6	83·1	34·0	45·5	27·4
Zande East	461	164·6	338·0	28·1	35·5	43·6	51·0	40·1
Zande West	462	61·8	208·0	21·3	25·3	24·0	27·9	23·2
KASSALA	5 - -	82·0	141·0	42·6	46·0	17·5	20·9	14·6
Kassala Rural	511	62·0	178·0	64·2	73·3	22·1	31·1	19·3
Hadendowa	512	43·8	119·0	40·1	43·6	11·8	15·3	10·4
Amarar & Bisharin	513	97·7	127·0	30·7	31·7	15·3	16·3	12·7
Gedaref North	521	38·5	162·0	49·1	56·3	18·3	25·6	17·3
Gedaref South	522	189·4	189·0	44·2	44·2	26·4	26·4	18·7
Kassala Town	531	33·6	79·0	44·0	46·1	7·7	9·9	6·5
Port Sudan Town	541	130·9	131·0	38·1	38·1	16·2	16·2	11·6
Suakin Town	542	251·7	252·0	34·8	34·8	22·0	22·0	13·6
Tokar	551	107·5	162·0	33·7	35·8	20·3	22·5	17·3
KHARTOUM	6 - -	71·4	125·0	40·7	42·5	14·9	16·7	12·5
Khartoum Town	611	99·7	111·0	36·9	37·3	13·9	14·3	10·6
Khartoum N. Town	621	69·7	126·0	43·7	46·5	15·1	17·9	12·6
Khartoum Rural N.	622	56·7	105·0	42·0	44·3	11·9	14·2	9·9
Khartoum Rural S.	623	52·4	102·0	43·5	45·9	21·0	23·4	19·5
Khartoum Rural E.	624	82·0	115·0	44·4	46·1	14·3	16·0	11·2
Omdurman Town	631	72·0	114·0	36·8	38·5	13·3	15·0	11·0

PROVINCE Census Area		Infant Mortality		Births		Deaths		
Name	Code	IMR	IMc IMR	CBR	IMc CBR	CDR	IMc CDR	N-IDR
KORDOFAN	7- -	76·0	124·0	50·0	53·1	15·5	18·6	12·3
Dar Bedeiriya	711	68·3	141·0	46·6	50·5	17·2	16·3	14·6
El Obeid Town	712	41·2	151·0	33·8	38·2	16·8	21·2	15·9
Gawama'a East	721	99·6	117·0	41·5	42·4	15·0	15·8	11·4
Gawama'a West	722	71·7	114·0	52·1	54·6	14·2	16·7	11·1
Northern Jebels East	731	38·3	121·0	39·5	43·2	13·0	16·7	12·0
Northern Jebels West	732	82·3	130·0	70·5	74·3	18·0	21·9	13·1
Kadugli	733	54·1	79·0	79·3	81·4	10·3	12·5	6·5
Central Nuba	734	97·6	166·0	58·3	63·1	22·5	27·3	17·8
Dar Kababish	741	72·3	79·0	36·5	39·1	8·9	11·5	6·5
Dar Hamid East	742	37·6	91·0	40·4	42·7	9·2	11·6	8·0
Dar Hamid West	743	56·1	72·0	42·7	50·1	7·8	15·2	5·6
Tegale North	751	89·8	114·0	45·5	46·7	14·6	15·9	11·0
Tegale South	752	155·4	159·0	46·3	46·5	23·5	23·7	16·9
Hamar North & East	761	77·3	192·0	47·9	54·7	23·9	30·7	21·2
Hamar South & West	762	39·2	91·0	42·1	44·5	9·4	11·8	8·1
Mesiriya Zurq	771	103·2	103·0	50·4	50·4	13·5	13·5	8·7
Mesiriya Humr	772	77·9	135·0	45·9	48·9	16·8	19·9	13·8
NORTHERN	8- -	66·7	103·0	43·0	45·4	12·1	14·4	9·6
Atbara Town	811	87·6	116·0	42·1	43·5	14·6	15·9	11·3
Berber	821	65·4	110·0	39·2	41·2	12·7	14·2	10·5
Dongola	831	65·6	84·0	38·1	38·9	9·3	10·0	7·1
Merowe	832	58·3	107·0	40·8	46·2	12·1	17·6	10·1
Ed Damer	841	111·4	158·0	50·5	53·3	21·6	24·3	16·8
Shendi	842	45·5	91·0	45·5	47·8	9·8	12·0	8·1
Wadi Halfa	851	83·1	90·0	50·1	50·4	11·7	12·0	7·9
UPPER NILE	9- -	143·9	215·0	69·3	76·9	32·6	40·2	24·1
Bor	911	112·3	141·0	67·7	70·0	21·2	23·5	14·5
Zeraf Valley	921	140·2	140·0	49·8	49·8	19·5	19·5	13·1
Eastern Nuer	931	216·9	238·0	80·6	82·8	42·9	45·1	27·1
Malakal District excluding Malakal Town	941	113·7	269·0	59·6	72·4	36·0	48·7	31·2
Malakal Town	942	95·0	193·0	41·3	46·3	24·4	29·3	21·3
Pibor	951	89·4	198·0	75·3	85·4	27·0	37·2	21·9
Renk	961	214·4	214·0	78·4	78·4	30·8	30·8	14·9
Western Nuer Ghazal	971	88·8	310·0	53·6	70·8	39·4	56·6	36·5
Western Nuer Jebel	972	118·4	166·0	78·5	83·0	25·8	30·3	17·8
Lau Nuer	981	155·1	327·0	81·0	101·4	48·6	69·3	38·7
Shilluk	991	143·6	265·0	69·9	81·4	38·8	50·3	30·7

THE FUTURE POPULATION SIZE OF KHARTOUM, KHARTOUM NORTH, OMDURMAN AND PORT SUDAN

by

R. A. Henin

FUTURE POPULATION SIZE OF THE FOUR TOWNS

The main factors which determine the future size of the population in these four Towns are the natural rate of increase, internal migration and international migration. We shall now deal with each factor in turn.

NATURAL RATE OF INCREASE

In the absence of more detailed data the difference between the fertility and mortality rates gives an indication to the natural rate of increase. According to the 1955/56 Census Year,[1] these figures were as shown in Table 1.

TABLE 1[2]

Towns	Total number of persons (000)	Number of births during past year (000)	Number of deaths during past year (000)	Crude birth rate per 100 persons	Crude death rate per 100 persons	Excess of birth rate over death rate per 100 persons
1	2	3	4	5	6	7
Port Sudan ..	48	1·8	0·8	3·8	1·6	2·2
Khartoum ..	93	3·4	1·3	3·7	1·4	2·3
Khartoum North ..	39	1·7	0·6	4·4	1·5	2·9
Omdurman ..	114	4·2	1·5	3·7	1·3	2·4

It is evident from the above table that the figures in columns 5, 6 and 7 vary a great deal. No explanation can be found for the relatively high fertility rate in Khartoum North, nor for the equally high mortality rate in Port Sudan. Furthermore, there is no reason why natural rates of increase should fluctuate a great deal between similar urban areas in the same country. For this reason the similarity in both birth and mortality rates in Khartoum and Omdurman suggest that these rates are more reasonable than those for Port Sudan and Khartoum North. However, for the sake of this exercise let us assume that the figures in the table are correct and represent the true natural rates of increase for these towns, and assuming that these rates will be maintained during the forty years subsequent to 1956, the following estimates of the population size of the four Towns are as shown in Table 2.

[1] There is no reason to suppose that these rates of natural increase will repeat themselves in subsequent years.

[2] *Source :* First Population Census of Sudan, 1955/56, *Final Report*, 1958.

TABLE 2
(000)

Towns	Population in				
	1956	1966	1976	1986	1996
Port Sudan	48	59	72	88	107
Khartoum	93	114	140	154	189
Khartoum North ..	39	50	65	84	108
Omdurman	114	151	187	232	288

INTERNAL MIGRATION

Migration from one area to another within the same country normally occurs chiefly as a result of different economic opportunities in the areas affected. An area where employment opportunities are high, or where good land is available for settlement, attracts migrants from less favoured regions of the same country. Demographic factors are also important. Differences in the rate of natural population growth among the different regions may tend to create currents of internal migration. Fertility is generally higher in rural districts than in urban area, though in some cases high rural fertility may be partly offset by relatively high mortality. The cost of transportation and the availability of transportation facilities are also amongst the factors that affect the "push" and the "pull" of internal migration. Furthermore it has been found that migration from the rural areas to urban areas bears a functional relation to the process of industrialization, technological advancement and other cultural changes in the cities.

Available statistics relating to internal migration are normally inadequate. Except in a few countries where population registers are maintained or where such information is available through social insurance or rationing programmes, no records are kept of the movement of the individuals from place to place within the country. Internal movements can therefore be estimated, if at all, only by indirect methods, that is, by comparing total population increases in various areas between successive census dates with the statistics of births and deaths during the interval, or by analysing census figures on place of birth or place of residence at some earlier date in relation to place of residence at the time of the census. These methods, however, are subject to error and often fail to yield any important items of information.

In all countries where a rapid development is taking place as is the case in Sudan—other things remaining unchanged—large scale migration from the rest of the country to the cities occurs. Since the rate of natural increase in urban areas has generally been well below the rural rate then the increase in the population of the four Towns under consideration must have also resulted from migratory movements from the rest of the country.

Internal migration can roughly be estimated by analysing census figures on place of birth or place of residence at some earlier date in relation to place of residence at the time of the census. No past censuses have been undertaken in the case of the Sudan and the following Table 3 shows the situation as revealed from the place of birth and place of residence statistics from the 1955/56 Population Census.

TABLE 3[3]

Towns	Total population (000)	Persons born in their place of residence	Persons born outside their place of residence (000)	Col. 4 as % of Col. 2
1	2	3	4	5
Port Sudan ..	48	14	34	70
Khartoum ..	93	31	62	67
Khartoum North ..	39	15	24	62
Omdurman ..	114	74	40	35

The length of the period during which the increase in column 5 above took place is not known but it may be fair to assume that they took place during the last thirty-five years, this period—in the absence of more accurate statistical data—being taken as the average expectation of life in the Sudan. Furthermore, in view of the fact that the figures in column 5 above do not represent net gains or losses, i.e. do not take into consideration the number of persons who were born in the area but are not now living in the area, let us assume, further, that for each person that was "pulled" in, half a person was "pushed" out. Dividing the figures in column 5 of Table 3 by 35, and dividing the resulting figure again by 2, we reach the following figures as possible rates of increase due to internal migration.

TABLE 4

Town	Column 5 of Table 3 / 35	Column 2 / 2
1	2	3
Port Sudan	2·0	1·00
Khartoum	1·9	0·95
Khartoum North	1·8	0·90
Omdurman	1·0	0·50

With the exception of Omdurman, the average rate of increase due to internal migration is about 1 per cent. This rate agrees with column 5 of the following table which shows the *net* gains or losses from internal migration by mode of living for the whole country.

[3] *Source :* First Population Census of Sudan, *Final Report.*

TABLE 5

PERSONS LIVING IN SUDAN: NET GAINS OR LOSSES FROM INTERNAL MIGRATION BY MODE OF LIVING

WHOLE COUNTRY[4]

Mode of living	Number of persons born in area (000)	Number of persons now living in area (000)	Net gain (+) or loss (—) (000)	Net gain (+) or loss (—) % of those born in area
1	2	3	4	5
Urban large	306	430	+ 123	40
Urban small	549	424	— 125	23
Rural sedentary ..	7,053	8,003	+ 950	14
Rural nomadic ..	2,354	1,406	— 948	40

As can be seen from the above table, while the number of persons born in urban large (whether now living or not) is 306,000, the number of persons now living in urban large is 430,000, i.e. a net gain of 123,000 persons or about 40 per cent of 306,000; and if thirty-five years is taken as the average expectation of life in the Sudan, then the increase due to internal migration in urban large is again about 1 per cent. It must be added here that the four Towns under consideration account between them for 68 per cent of the total population of urban large.

If we add this 1 per cent to the natural rate of increase from column 7 of Table 1, we get the following figure for 1966, 1976, 1986 and 1996.

TABLE 6
(000)

Towns	Population in				
	1956	1966	1976	1986	1996
1	2	3	4	5	6
Port Sudan	48	63	83	110	145
Khartoum	93	124	165	219	291
Khartoum North ..	39	54	75	104	145
Omdurman	114	153	205	275	369

[4] *Source: op. cit.*

The population size for 1996 must not be taken too seriously for amongst other things it has been assumed that the increases due to both natural rate of increases as well as internal migration will be maintained until the close of the century. Furthermore, it all depends upon the "pull" exercised by other types of mode of living, which is discussed below.

In agricultural countries similar to the Sudan rural-urban migration has been the most important kind of internal migration. Their case, however, is different from that of the Sudan for they are mainly countries with dense agricultural population while in the Sudan there is no "push" of land scarcity, on the contrary there is a "pull" of virgin land available and the room for agricultural development is quite great and is capable of absorbing almost any increase in the population. In other words, whether the present rate of "urban large" growth will be maintained depends a great deal on the relative "pulls" exercised on the one hand by the rate of agricultural development and the rate of development of commerce, industry and trade in towns on the other. The present picture is shown in Table 5 above, together with the following table 7 below which shows the analysis of these net gains or losses : that is the magnitude of the "pull" exercised by rural sedentary and urban large on the one hand and the "push" provided by rural nomadic and urban small on the other.

TABLE 7

ANALYSIS OF GAINS (+) AND LOSSES (—) OF TABLE 5

WHOLE COUNTRY[5]
(000)

Mode of living	Net Gains (+) or Losses (—)	Urban Large	Urban Small	Rural Sedentary	Rural Nomadic
Urban large ..	+ 123	—	+ 48	+ 68	+ 7
Urban small ..	— 125	— 48	—	— 74	— 3
Rural sedentary ..	+ 950	— 68	+ 74	—	+ 944
Rural nomadic ..	— 948	— 7	+ 3	— 944	—

It can readily be seen that urban large is met by a very strong competition from rural sedentary. In absolute terms while the net gain of urban large is only 123,000 persons, that of rural sedentary is 950,000 persons or almost eight times as much. It can also be seen that nomadism as well as urban small seem to be on the decline. The bulk of nomads seem to settle in the villages while urban large (mainly the four Towns under consideration) is fed mainly from rural sedentary, followed by urban small and nomads.

What are the sources of the "push" element ? That is, from where does the influx come ? Short-distance moves are normally the rule in the case of internal migration. As can be seen from Table 8 below, this is also the case in the four

[5] *Source : op. cit.*

Towns under consideration. All four Towns, however, share one phenomenon in common. Northern Province always comes first as the main source of supply but this is a characteristic of the Northern Province where the "push" element is amongst the strongest in the country. The Northern Province is always followed by the Province of the town concerned.

TABLE 8

Towns	Persons born outside their place of residence (000)	From Northern Province (000)	Column 3 as % of Column 2	From Province of Town (000)	Column 5 as % of Column 2	From other Provinces (000)	Column 7 as % of Column 2	From Abroad (000)	Column 9 as % of Column 2
1	2	3	4	5	6	7	8	9	10
Port Sudan ..	34	16	49	9	26	5	15	4	12
Khartoum ..	62	24	39	11	18	17	27	10	16
Khartoum North	24	8	33	7	29	7	29	2	8
Omdurman ..	40	11	28	6	15	18*	45	5	13

* Of this figure 8,000 came from Blue Nile Province and 6,000 came from Kordofan Province.

INTERNATIONAL MIGRATION

It may be recalled that during the Sixth Annual Conference of the Philosophical Society of the Sudan a figure of 10,000 has been quoted as representing the average number of persons who immigrate annually to the Sudan. How many of these 10,000 settle in the four towns under consideration is unknown, but it must be a small number, so small, in view of the fact that the majority of the 10,000 are westerners who go to the Gezira, that it is not worth considering. However, the magnitude for each town can be gauged from columns 9 and 10 of Table 8 above.

SOME ASPECTS OF THE DEVELOPMENT OF GIRLS' EDUCATION IN THE NORTHERN SUDAN

by

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During the first sixty years of the twentieth century, girls' education developed in the Sudan, as in other countries, as a by-product of the expansion of schools for boys; but much more slowly than the latter. The following figures show the number of schools for Boys and for Girls as at 1960.[1]

	Boys' Schools	*Girls' Schools*
Subgrade	712	207
Elementary	565	245
Intermediate	89	25
Secondary	12	2

In addition there were 14 technical intermediate and secondary boys' schools, and the Khartoum Technical Institute providing vocational and technical training for boys; but there were no vocational or non-literary schools for girls, apart from a Nurses' Training College with 11 Students.[2] Religious education included 28 intermediate, six secondary and one higher religious school for boys; but there were none for girls. At the university level there was the greatest disparity, in that whereas there were 1,164 men students there were 52 women students only. In non-government schools, which include Sudanese private schools, Arab and Christian mission schools and the Greek, Indian, and Armenian community schools, there were approximately 4,980 boys as compared with 1,319 girls. As regards literacy, in 1956, counting as literate all Sudanese aged ten and over who had attended elementary school, whereas 30 per cent of the male population were literate only 4 per cent of the women could read and write. Literature produced by the Publications Department, and the existence of boys' after-school clubs helped to prevent some elementary school boys from lapsing into illiteracy after leaving school. There were no comparable facilities for girls, which leads one to suppose that the disparity between the numbers of literate men and women is even greater than these figures show.

How has this situation arisen? Let us first look at the main trends in the development of girls' education, against the background of education in general over the past sixty years. Despite the fact that scarcely any girls ever attended khalwas there were, from Fung times, some literate women. In the "Tabaqat", the Lives of the Saints, written by Wad Daif Alla at the end of the eighteenth century, there are several references to holy, learned women.[3] In fact some women became saints and others were in charge of khalwas. In the "Tabaqat", we learn that a certain Khojali *b.* 'Abd ar-Rahman (died 1742)[4] was born on the Island of Tuti and entered the khalwa of the *faqira*[5] 'Aisha bint walad Qaddal". Nevertheless before the

[1] *Ministry of Education Statistics, 1959–1960*; (Publications Bureau, Khartoum, 1960).

[2] The Nurses' Training College is administered by the Ministry of Health, not by the Ministry of Education.

[3] "Tabaqat", M.71, S 74, *apud* J. S. Trimingham, *Islam in the Sudan*, London, 1949, p. 130.

[4] *Ibid.*, p. 130.

[5] i.e., a woman religious teacher.

beginning of the Condominium for the vast majority of Sudanese girls there was no education other than that of oral tradition handed down at mother's knee.

Although the aims of education as expressed by Sir James Currie, the first Director of Education and Principal of the Gordon Memorial College, were limited in character, nevertheless government education for boys spread quite rapidly after the establishment of the first elementary schools in the first decade of the century and the inauguration of the Gordon Memorial College in 1902. As early as 1904 there was a small secondary section for boys in the Gordon Memorial College and intermediate, technical, industrial and teacher training courses soon developed. The Kitchener School of Medicine opened in 1924 and by 1931 the following was the situation in boys' education:

Type of School	*No. of Schools*	*No. of Boys Attending*
Elementary	89	9,339
Intermediate	11	1,272
Secondary	1	534
Instructional Workshops ..	3	372
Teacher Training College ..	1	44

There was no equivalent expansion of government education for girls.

By 1921 there were five government elementary schools for girls at Rufa'a, Kamlin, Merowe, Dongola and El Obeid[1]. These started as a result of the pioneering zeal of Sheikh Babiker Bedri. As early as 1906 Sheikh Babiker founded at Rufa'a the first girls' school to be subsidized by the government and it was his enthusiasm which encouraged Sir James Currie to sponsor schools in other towns. In fact Sheikh Babiker travelled around with some of his educated girls in order to encourage girls' education. But public opinion was very opposed to his work. The government did not try to force the pace of girls' education, but waited for the demand before expanding educational facilities for girls.

The next epoch in the history of girls' education was the opening of the Omdurman Girls' Training College in 1921. The success of this institution was due to the pioneering zeal of the two Misses Evans, the elder of whom was the first principal of the college. By her efforts elementary schools very gradually increased but it was not until 1939 that the first government intermediate school for girls was opened in Omdurman. From 1932 to 1946 when boys' education was spreading, as a result of reports of various international commissions, the importation of skilled educators and the founding of Bakht er Ruda, girls' education expanded very slowly. In fact it was not until 1945 that a small secondary class, which moved to the present premises of the Omdurman Girls' Secondary School in 1949, was added to the Omdurman Girls' Intermediate School. From 1946 to 1956 when emphasis was on quantative rather than qualitative expansion of boys' education at all levels in order to meet the forthcoming needs of an independent country for educated personnel to take over the administration of the Sudan, a chance of more rapid expansion of girls' education was lost. Since 1956 although there has been expansion of girls' education it has had to take a second place to the national need for technical trainees and educated men of all calibres.

[1] Sudan Government, *Report of the Education Department, 1928*, London, 1929.

Why was the development of girls' education so slow? It was partly due to the special status of women in Sudanese society, their segregation and the conservative attitude of the population. Any foreign notion which might encroach upon the prevailing social system was regarded with intense suspicion. Women, too, were convinced that any change would be a sin contrary to the Will of Allah. The government whilst not opposing, tolerated rather than encouraged girls' education in the early part of the century. At the beginning of Condominium rule Lord Cromer had pledged his word to an immense assembly of northern Muslim leaders that no prosyletizing would take place in predominantly Muslim areas.[1] The government feared that the establishment of girls' schools at that time would be considered by the Sudanese as an interference with the traditions of the country. From the government point of view girls' education was not a necessity. Missionary societies which might have speeded up the pace were not allowed to open schools immediately after the establishment of the Condominium. Later, in the twenties and thirties when the government was expanding educational facilities for girls as public opinion began to see its advantages, the quality of education given to girls was superior to that for boys but the quantity was limited in order to maintain standards. The government wanted the public to understand the value of education for girls at a time when the vast majority of the population still opposed it. In the late thirties and forties when there was so much concern for the development of boys' education, and when more trained educators were recruited to teach the boys, people were too interested in educational opportunities for boys to concern themselves with education for girls. From 1946 after the establishment of the Advisory Council for the Northern Sudan when it was clear that the Sudan would shortly become independent, the emphasis was on expansion of schools at all costs for boys, and funds were insufficient for much educational provision for girls. It was easy to see the advantages of increased technical, vocational and academic education for boys whereas people did not consider that girls, who married very early in life in any case, repaid the Sudan in service for expenditure on their education. The greater expansion of girls' education has come in the last fifteen years only and the demand has far outweighed possible provision.

I shall now discuss the parts played by schools of various types in the early history of girls' education, from 1900 to 1932. First, the work of Sheikh Babiker Bedri which was the seed from which government education for girls in the Sudan grew. Sheikh Babiker Bedri, the well-known pioneer, is in fact, regarded in the Sudan as the "father of girls' education". He was a truly remarkable man considerably ahead of his time. He alone early in the century, in opposition to his contemporaries, saw the great need for girls' education if the society was to develop. Sheikh Babiker was a close friend of Bishop Gwynne who in the early days of the Condominium was trying to persuade the government to let the Church Missionary Society open schools for girls and boys. Sheikh Babiker was greatly influenced by his mother.[2] He was especially convinced of the need for girls' education by his period of captivity of two years and eight months in Aswan, Egypt as a prisoner-of-war with Wad En Negumi's forces. There he enjoyed the company of a group of Sudanese women whose characters and bravery impressed him strongly. It was during this time that his first marriage took place. His mother and three sisters were with him in Aswan. At that time Sheikh Babiker became a strong protagonist of education for girls.

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[1] Lord Zetland, *Lord Cromer*, London, 1935, p. 250.

[2] Sheikh Babiker Bedri, *Ta'rikh Hayati*, 3 Vols., Khartoum, 1961.

When Sheikh Babiker Bedri returned to Rufa'a after his captivity, he opened in 1906, in the face of strong public hostility, a school for girls in his own house. It began mainly for the instruction of his own family and soon expanded.[1] Even the majority of his own relatives strongly opposed him. During the first year four of his daughters and twelve of his relatives attended the classes. The girls were taught five lessons daily of weaving and needlework and one period of Arabic language.[2] The needlework was traditional Sudanese embroidery and the girls made caps for their brothers. School lasted from 7 a.m. to 2 p.m. and from 3 p.m. to 6 p.m. daily.

At that time Sheikh Babiker tried to influence his associates to take an interest in girls' schools but they all refused to take his projects seriously. When he requested £20 to build one room which, if not used for girls' classes, could become a store room for the boys' school, the Mamour refused him permission. Sheikh Babiker reports in his diary[3] that he then approached the government to ask for a girls' school. Sir James Currie replied that he did not think public opinion was ready for this. Sheikh Babiker then informed him that if he would visit Rufa'a he could see for himself a girls' school in Rufa'a in the Sheikh's own house.

In 1906 there was a petition to Sir James Currie for the opening of a girls' school in Khartoum.[4] The majority of signatures were from Egyptian officials wanting education for their daughters in a non-sectarian atmosphere. Sir James Currie said that the necessity for creating such a school was fully recognized and that he hoped that before long funds would be available for it. In the meanwhile he thought that the place to begin was Rufa'a where he had heard "that there was an efficient local kuttab already existing under an extremely competent and interesting local man". However, in 1907 two class-rooms for girls were added to the Khartoum Boys' Elementary School pending the opening of the Girls' School planned for 1909.[5]

By 1907 there were seventeen girls in Sheikh Babiker's school, of whom twelve belonged to his own family, the others being the daughters of friends. Sheikh Babiker reports that he then launched another campaign to influence public opinion, saying that Sudanese girls had in fact been in the Koranic schools, the Suakin Khalwas for example, in 1310 A.H.[6] He now hired a school-mistress at ten shillings per month to teach in his school and he was able to make about one pound per month by the sale of the work of the girls.[7] Sheikh Babiker wrote a special Arabic text book for the girls, as he said that the one used by the boys was unsuitable. Mr Dickenson, Governor of Blue Nile Province, reported to Sir James Currie that he had seen the girls in Sheikh Babiker's school in April, 1907 reading, writing and counting up to 99.[8]

In December, 1907 Sir James Currie visited the Rufa'a school. Sheikh Babiker had had to secure the parents' permission before allowing him to enter. Sir James arrived at 5 p.m. On asking how much the school had cost he was told

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[1] Information from Sara Bedri, one of the first pupils of the school.

[2] *Ibid.*

[3] B. Bedri, *op. cit.*

[4] *Annual Report of Education Department, 1906*, Khartoum, 1907.

[5] Report on the Finance, Administration and Condition of the Sudan, 1907, London, 1908, p. 571.

[6] B. Bedri, *op. cit.* (1310 A.H. is *c.* A.D. 1893).

[7] *Ibid.*

[8] *Ibid.*

"fourteen pounds". He then enquired if Sheikh Babiker required anything.[1] The Sheikh replied that he would like the government to take over the school and pay him £E4 monthly so that he could engage a good teacher, Sitt Abuha from Wad Medani. This was approved. The Sheikh then asked for £E200 to erect a building near the boys' school. He was delighted when this also was approved. Sir James Currie suggested that instead of the girls making the "taqia" (men's caps) for sale they should learn how to make their own clothes.[2] Hence the first government school for girls in the Sudan began. From this time the school gradually became more firmly established. Dickenson Pasha[3] made arrangements for the salary of £E1 per month to be paid to the ghaffir.[4] But the Shari'a Court, the Assistant District Commissioner and the head of the Shukria tribe were all still opposed to the work of Sheikh Babiker.[5] They aroused public opinion against him but Dickenson, the governor, supported him against them.

Sir James Currie was now convinced that the time had come for further expansion of government education for girls. But owing to the collapse of the educational programme in 1907 on account of financial stringency, the establishment of the Khartoum Girls' Elementary School had to be indefinitely postponed.[6] From 1916 it was the Director's policy to send the girls who had completed the four year course in the Rufa'a school to the Khartoum Church Missionary Society School, the present Unity High School, for a further two years of teacher training. The first pupils belonged to the Bedri family. Umselima Bedri was one of the earliest. Sitt Abuha Mustafa, who was teaching in Rufa'a, was the first teacher to go to the Church Missionary Society School in 1911 for teacher training. Sitt Abuha and Sitt Nafisa Makawi, relatives of the Bedri family, told me how much they enjoyed their studies especially at Unity High School and how disappointed they were when their families withdrew them.[7] Sitt Adila Bedri told me how she had spent one month at Unity High School at the age of ten after which, to her great disappointment, she was withdrawn by her uncle Yusif just as she had become interested in learning to play the piano. In 1916 'Aisha Mohamed Ahmed began to attend the Khartoum Boys' Elementary School. She was then advised by Sir James Currie to go to the Church Missionary Society School. Although public opinion opposed her strongly, she was encouraged by her father Sheikh Mohamed Ahmed Fadl, and followed Currie's advice. She enjoyed her four years' elementary and three years' intermediate education which included in addition to the basic subjects, the study of the Christian Faith, Music and Games.

However, until very recently there was, particularly at the higher levels, more educational provision available for girls in the Sudan (though not necessarily for Sudanese girls), from non-government than from government sources. In the non-government sphere the Christian Missionary Societies were the pioneers and it is to them now that I turn.

The first girls' schools in the twentieth-century Sudan were established by the Italian Roman Catholic Verona Fathers' Mission. Christian missionary societies

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[1] *Ibid.*
[2] *Ibid.*
[3] *Ibid.*
[4] i.e. a gate-keeper.
[5] B. Bedri, *op. cit.*
[6] *Annual Report of the Education Department, 1908*, Khartoum, 1909.
[7] Personal communication.

had entered the Sudan in the earlier part of the nineteenth century but had met with disruption at the hands of the Mahdists. At the commencement of the Condominium they sought permission to recommence work. After repeated requests the government relented because there was a demand for education from the Christian communities. The government felt that schools in the capital could be easily supervised and that the Muslim population would more easily comprehend a policy of religious toleration. Moreover, the demand from both Muslims and Christians was more than the government could meet. Thus the missions were allowed to start educational and medical work in the capital and other larger towns in the North.[1]

The Verona Fathers' Mission started two schools for girls in 1900, one in Khartoum, St. Anne's School, and the other in Omdurman, St. Joseph's School. Kindergarten and elementary classes were started at once and an intermediate section developed later. A spacious new two-storey building[2] was constructed to house St. Anne's School which was quite an outstanding building at that time. An official report shows that in 1924 there were 140 girls in the Omdurman School, and 300 in the Khartoum School. The government stipulated that Muslim children should not be compelled to attend lessons in the Christian Faith and parents had to sign a declaration of their consent before any such attendance was permitted.

It is interesting to investigate why, at the beginning of the century when most of the population was so violently opposed to education for girls, so many girls attended the Catholic schools. In the very early days some financial inducement was given by the mission to encourage parents to keep their daughters at school,[3] but very soon after the mission had declared the Khartoum and Omdurman Girls' schools open to all prospective pupils without discrimination girls of all nationalities flocked for admission. The earliest pupils were mostly Syrians or Egyptians or girls of European extraction, the daughters of residents of Khartoum and Omdurman; of merchants, government officials, clerks or professional men of middle-class families who were eager to have their daughters educated. However, some Muslim girls were entrusted to the schools in the early days and their numbers soon increased. The presence of the Sisters in the schools possibly encouraged parents to entrust their daughters to the schools.

The Church Missionary Society has also played an important part in the development of schools for girls in the Sudan. The single school for girls which has had the greatest impact upon Sudanese and international society in Khartoum or in the Sudan as a whole is Unity High School which owes its early growth to the Church Missionary Society. Bishop Llewellyn Gwynne was one of the early pioneers in girls' education. He arrived in Khartoum in 1899. One can read in Unity High School Log Book how Lord Kitchener was not keen for the Society to commence work in a Muslim area.[4] But after repeated requests by Bishop Gwynne the government gradually relaxed its rigid policy and ultimately gave financial support to the C.M.S. schools.[5]

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[1] The Catholic Missions had begun educational work for girls even before the Mahdia. A school admitting both girls and boys had been opened in El Obeid as early as 1871—Information from Bishop Baroni, Vicariate Apostolic, Khartoum.

[2] This was on the east side of the present Khartoum central tramway station.

[3] Information from Bishop Baroni, Vicariate Apostolic, Khartoum.

[4] Bishop Gwynne, Unity High School Log Book.

[5] *Ibid.*

In 1902 the Copts were complaining that they had no girls' school, and in July a school was opened by the Coptic authorities, assisted by Bishop Gwynne, to be a Coptic Community School for Girls.[1] In April 1903[2] the school was taken over by Bishop Gwynne for the C.M.S. Chronologically then this was the third school for girls in the Sudan. Later the school was established in what was then the Stamatopolos' house in Sirdar Avenue. The subjects taught were Holy Scripture, Arabic, English, Reading and Writing and Needlework. The school expanded rapidly and by May 1904 there were eighty girls of whom sixty-three were Muslims, six Protestants, nine Copts and two Greek Catholics. A few girls were exempted from the Christian Religious Instruction according to the Conscience Clause of the government but many opted to avail themselves of these lessons. In 1905 the Church Missionary Society built the school which houses Unity High School today. Nearly an acre of land was purchased for £E150. Just afterwards there was a great land boom and an offer of £E8,000 was made for the same land. Bishop Gwynne wanted to build on half the land and sell the remainder for £E4,000 but the Society would not allow this.[3] So the present Unity High School was built. In 1928 the school was taken over by a Fellowship of Christian Churches to be a secondary school for girls and the present Unity High School was opened.

The American Presbyterian Mission too played a pioneering part in the early education of girls and women in the Sudan. The American Presbyterian and Church Missionary Societies, encouraged in a policy of co-operation by Bishop Gwynne, agreed not to open schools adjacent to one another. As the C.M.S. had a boys' school in Khartoum, the American Mission chose Khartoum North as the site for their girls' school.[4] Of the American Mission schools for girls Khartoum North School has made the greatest impact upon society. The school opened on 1st September, 1908. It gradually developed from elementary to intermediate and then added secondary classes. During the first year there were nine boarders, most of whom being orphans or in special need, had been cared for in the home of a married missionary couple before the school opened. The school opened with an enrolment of ten, the total enrolment the first year being fifty-six, in the second eighty-five, whilst the third year registered 133. A quotation from the report of 1911 reads, "The ease with which the girls learn to sew is encouraging". From the beginning "Neatness, cleanliness, order and arrangement"[5] were stressed. The school included Muslims, Copts, Protestants, Jews, Sudanese, Egyptians, Syrians, Abyssinians and Armenians. Some of the pupils became teachers in the school later. In 1933 a boarding system developed by which four cottages were provided each to house ten girls, on a family system. Each group of girls was given an allowance on which to run the house, similar to that which she would receive on marriage. In this way special attention was paid to domestic training.

In addition to government and mission schools, in the early part of the century the Greek, Armenian and Indian communities began to provide education for the girls of their communities similar to that of the country of origin. Greek schools admitting both sexes soon developed from kindergarten to university entrance standard. Later on Egyptian schools provided some education for Sudanese girls, and private Sudanese schools began.

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[1] C.M.S. Records.

[2] In 1906 the C.M.S. opened a girls' school in Omdurman.

[3] Unity High School Log Book, Unity High School, Khartoum.

[4] American Presbyterian Mission records, by courtesy of Miss Pillow, A.P.M., Khartoum.

[5] 1908 Report of the Mission.

From 1920 the opposition of public opinion to girls' education gradually lessened a little. Government education for girls could clearly make little serious progress until Sudanese teachers could be trained. The second chapter, therefore, of girls' education opens with the work of the two Misses Evans which centred around the Omdurman Girls' Training College of which Miss J. D. Evans was the first principal. It was from this centre that the higher schools, the Omdurman Girls' Intermediate School and the Omdurman Girls' Secondary School, developed; and from it that the other teacher training colleges and secondary schools have branched.

From the early days the principles and aims of girls' schools were more practically inspired and had less of a purely literary and academic bias than those of boys. Girls were to be educated for the intrinsic value of human development, and schools were to aim at raising the status of women in Sudanese society and at the improvement of home life. Miss Evans relates that on her arrival in December, 1920, there were five government kuttabs for girls with an average attendance of two or three hundred girls.[1] The schools were staffed by a Sheikh who taught the Koran and rudiments of reading, writing and arithmetic; and a village woman who taught Sudanese embroidery. The first need was to train Sudanese girls to teach. By the influence and example of Sheikh Babiker Bedri, who sent one daughter and two nieces to be trained, the parents of two other girls were persuaded to allow their daughters to take the training course, this making a total of five as a start.[2] The number had to be increased. With this object in view Miss Evans spent the first two months visiting the existing kuttabs. But the girls were at the marriageable age and it was difficult to persuade parents to allow their daughters to leave home.

To encourage parents to allow their daughters to attend the college, mothers and grandmothers were allowed to accompany their daughters to the boarding house of the Training College in the early days. In order to persuade them to part with the girls for two years' training and two years of teaching, in 1925 the government agreed to grant to any teacher who taught for four or more consecutive years a bonus on marriage equivalent to one month's salary for every year of service. This had the desired effect and more women remained longer as teachers in order to qualify for the bonus.[3] Educated girls were now in greater demand as wives so prejudice began to disappear. Miss Evans relates that in the early days when Sitt Umselima went to visit Dongola to select elementary school girls for the training college, after she had chosen one candidate the father sent a maid-servant of the family instead, as he considered it degrading to send his daughter.

Miss Evans emphasized the practical side of the training, utilizing familiar material available in the pupils' own villages. She tried to "keep the curriculum free from unsuitable European elements which so often take from the pupil what she has, without giving in return anything worth having". The secret of her success was the complete adaptation of the training to the needs of the people. The college expanded and so did the number of girls' schools.

For the first three years of the life of the college the staff consisted of a Sheikh, educated at the Gordon College, a Sudanese woman who taught handicrafts and embroidery, and two Egyptian teachers. These latter mistresses, however, did not return in October, 1924, when a difficult period ensued with young, inexperienced

[1] *Annual Report of Education Department, 1928*, London, 1929.
[2] *Ibid.*
[3] *Ibid.*

teachers and constantly increasing numbers of pupils. In 1925, Miss Evans's sister, Miss D. Evans, was appointed to the staff. Miss Evans continued her research into the mentality and needs of the women and girls. She studied their customs, crafts, folklore, games, work, minds and moral sense. She says of her pupils, "The inherited impulses, predispositions or instincts are much stronger than ours. They are sensitive to the slightest antagonism, disapproval or superiority and retreat behind a wall of reserve. They are generous, loyal, courteous and patient, cheerful, happy, friendly, seldom quarrelsome or resentful and never bitter or sulky". Miss Evans taught the girls the value of social service, especially to other women. Seeing the need for adult education for women she also envisaged the ultimate development of Women's Village Institutes.

Girls' elementary education was well grounded and was geared to the needs of the girls after leaving school. In 1932 when the Winter Committee[1] was recommending a reassessment of the curriculum, aims, and teaching methods in boys' elementary schools, it recommended a reorganization of boys' education more on the lines of the girls' schools. This says much for the achievements of the early pioneers. But the misfortune was that intermediate and secondary schools did not develop much sooner. Had they developed in the twenties, girls' education would not have been so far behind that of boys. Bakht er Ruda, founded in 1934, completely reorganized boys' elementary schools and then continued to work on the curricula, syllabuses, teaching methods and teacher-training for boys' intermediate schools, But in all this, girls' education lagged sadly behind. The De La Warr Commission[2] in 1937 stressed the need for higher, intermediate and secondary schools for girls and stated that the lack of these was seriously impeding the progress of the Sudan. But still there was no separate secondary school until 1949.

I believe it was Newbold who pleaded that Bakht er Ruda should train mistresses as well as masters. Had this happened in 1934 girls' education would have developed on lines more in keeping with the needs of the country. The Omdurman Girls' Training College could not progress as Bakht er Ruda had done because of the prejudice against education for girls. From the late thirties boys' intermediate and secondary schools were greatly improved and developed more in keeping with educational philosophy in other parts of the world but until almost the present day girls' education jogged along at a very slow pace. The long pause between the establishment of elementary education on a comparatively large scale and the foundation of the first government intermediate school tells its own story. How far this stagnation was due to traditional opposition and how far to lack of enterprise on the part of the education department it is not yet possible to assess. But girls' intermediate and secondary education has been considerably handicapped as a result of it. It was only in 1960 that an Intermediate Teacher Training College for mistresses, similar to those already in existence for masters, was opened. But the future looks more promising : I understand there were in 1961 nine women in the High Institute which had just opened in Omdurman for the training of secondary-school teachers.

From 1946 to the present day the key to educational development for boys has been numerical expansion at all levels. "Sixth Form" work, provided for in the Brown plan, was sacrificed to quantitative expansion. Everybody wanted an

[1] R. K. Winter, "Educational Policy, Northern Sudan", C.S. Archives, EH/17.A.1 of 3rd July, 1932.

[2] C.S. Archives, 17 B, 1, "De La Warr's Commission and Report, 1937".

academic, literary education. Recent policy towards girls' education has been to bring it into line with boys' education. But this has existed in theory rather than in practice until very recently. The strong dislike and suspicion of a more practical type of education with less of a literary bias has spread to the girls' schools.

Late as it was in appearing, the demand for girls' education became intense from the nineteen-fifties. The lengths to which parents would go to get daughters into schools is evidence of a great change. On account of Sudanese traditions for women and the different rate of expansion of educational provision the problems of girls' education today differ essentially from those of boys. The social background of the girls, their lack of educational tradition, the environmental ignorance from which many of them come, the survival of scepticism about the usefulness of girls' education, the heavy social obligations of women, all make great demands upon the girls. It was in 1954 only that the secondary school course was reduced from five to four years. The girls of course have far more ground to cover in their four-year secondary course. It will take several years more for the intermediate teacher training college for women to effect a higher standard in girls' intermediate schools. It was in the last year or two only that expenditure in girls' secondary schools has at all approximated that of boys.

The first woman to enter the Gordon Memorial College, Khartoum, did so in 1945 from the Unity High School, the same year in which government secondary education for girls started in Omdurman. The main expansion of girls' education since that date has taken place during a period of rapid political change, whereas boys' education was firmly established in a period of comparative political stability under highly trained staff. The drive for good examination results at all costs by cramming, and emphasis on examination tactics even to the detriment of real intellectual development, has affected girls' schools and it is easy to see why. The girls are desperate to reach the university in order to demonstrate their ability to profit from the highest level of education. The recent drive towards uniformity as between girls' and boys' schools is good in as far as it raises the standard in girls' schools and enables books and materials to be available to girls in a more adequate supply. But a great deal of new thinking is necessary to plan future courses for girls. Studies may not necessarily be the same as those for boys. The needs of the educated Sudanese woman of the future in all her roles has to be considered.

Sudanese girls today urgently need further educational opportunities. At the intermediate stage teachers of equal training and ability as the masters in boys' schools might be appointed to the girls' schools, which would mean that more masters would have to teach in the girls' schools until women have been more highly trained. If it is essential for some weak teachers to teach it would be better for them to teach in the boys' rather than in the girls' schools at this stage. A great reform, recognized in principle but not yet put into practice, would be the unification of the girls' and boys' secondary entrance examination. When the examination is the same the standard of work in the girls' intermediate schools will rise. In the past the girls have had to be given extra lessons at the secondary level in some subjects to enable them to cover the required ground so as to compete academically with the boys at university entrance. This will be necessary until the girls enter secondary school at a higher level. It is at the secondary level that more difficulties arise and therefore the girls' secondary schools need the very best teachers and a generous staffing allocation.

Ten years ago there were five intermediate schools offering candidates for examination for the twenty-five places in the one secondary school. In 1962

there are thirty-two intermediate schools competing for 350 places in five secondary schools. The girls are working hard and are impatient. This expansion demands urgent curricular replanning to meet the needs of the 350 girls leaving school annually from 1965. Boys' secondary education has been partially diversified to meet the needs of the boys as well as the needs of the Sudan. But for the girls there is still only the literary type of secondary education. Qualified Physical Education mistresses were appointed to the girls' secondary schools in 1961 and domestic science courses are planned but the staff is not yet available. The Minister's New Plan for various types of secondary schools will be of special value to the girls. But there are likely to be difficulties unless provisional steps are taken during the next ten years while the plan gradually evolves into full practice. The extent of practical, vocational, and literary studies needs to be carefully worked out so that the same amount of time is devoted in girls' and boys' schools to the various types of study, although the subjects studied may be varied.

It will be obvious from the foregoing that girls' education in the Sudan is today at a very critical stage. The difficulties are great and educational concepts and objectives are only just becoming firmly defined. Misjudgments made now will be difficult to rectify in the near future. Yet decisions must be made urgently, if only to cope with the explosive growth in demand during the last seven years or so. But the problems of girls' education are certainly not insoluble. Given bold and imaginative planning (especially in the provision of premises and equipment and in the training of teachers), and the sympathetic encouragement of those in high places, girls' education can develop in a way which will make it a source of legitimate pride to the citizens of the Sudan.

THE DEMAND FOR SOFT DRINKS IN THE SUDAN: A CASE STUDY[1]

by

A. A. El Sherbini

I. OBJECTIVES OF THE STUDY

Early in June, 1958, the Sudan Government imposed a tax of 1.5 piastres (P.T.) per gallon of petrol sold by service stations, and a tax of 22.500 Pounds (LS.) per ton of sugar sold to consumers. Both taxes were immediately shifted to the ultimate consumer. Thus, faced with rising operating costs, all major bottlers in the Sudan raised their wholesale prices by two piastres on every case of twenty-four bottles as from 16th June, 1953.

Again, an excise duty of P.T. 12 per case was imposed by the Government as from 1st August, 1958. This duty was also passed on to the dealer, in whole or in part, who in turn passed it on to the ultimate consumer.

These developments provided important observations which were used as a basis for gauging the price-elasticity of demand for soft drinks in the Sudan. This, however, was not the sole objective of the study. Thus, as the study progressed, it was possible to arrive at other findings of relative importance.

In summary, this study aims at realizing three basic objectives :

1. To delineate all the relevant factors affecting the demand for soft drinks and to demonstrate their relative importance. This objective also includes an attempt to study some of the qualitative characteristics of the demand for soft drinks in the Sudan.
2. To arrive at a quantitative estimate of the price-elasticity of the demand for soft drinks. This estimate is made for the entire market, as well as two sample markets with different income levels, consumption habits, etc.
3. To examine critically the soundness of the excise duty levied by the Government.

II. HISTORICAL BACKGROUND

Structure of the Market

The present status of the soft drink industry in the Sudan approximates very closely the market structure of a differentiated oligopoly. Three firms have a combined share of over ninety per cent of the total market. The firms, in order of their market-share importance, are the Pepsi-Cola Company, the Loiso Company, and the Coca-Cola Company.

Both Pepsi-Cola and Coca-Cola operate modern plants equipped with fully automatic machinery and up-to-date facilities including a fleet of modern trucks. The Loiso firm utilizes semi-automatic bottling machinery and uses less modern techniques for handling, warehousing, and delivery.

Beside the three major firms, there are several other small bottlers of little significance operating mostly in the non-urban areas. They use very primitive

[1] I am greatly indebted to the management of the Coca-Cola Company (Sudan) for providing all the necessary data and information without which this study would not have been possible.

production methods and owe their survival to the reluctance of the three major firms to expand their geographical distributions.[1]

Aspects of Competition

Competition among the three major firms is strictly non-price competition. The three firms maintain equal prices for the same size of bottle. Price changes are made concurrently and only in the face of major developments.

Non-price competition takes many forms. Advertising, contests, and other sales promotion techniques are used intensively by both Coca-Cola and Pepsi-Cola. Loiso, on the other hand, relies mostly on dealer's support by allowing the dealer a higher margin than the other two firms.

All the three firms make use of similar channels of distribution in marketing their products.

The Coca-Cola Company

A historical background of the operations of the Coca-Cola Company of Sudan is necessary since the data used in this study pertain solely to this company.

The Coca-Cola Company was established late in 1955 by a prominent Sudanese business family under a franchise agreement with the major company in New York. Already the Pepsi-Cola Company (Sudan) and the Loiso Company had been in full operation for a little over four years. The two companies were well entrenched in the market at the time the Coca-Cola was introduced.

Pepsi-Cola sells one large ten ounce bottle. The Loiso, on the other hand, is a seven ounce bottle. Coca-Cola entered the market with a small six ounce bottle. Consumption habits showed little inclination to adjust immediately to the new small bottle, a direct competitor to Pepsi-Cola. Subsequently, the Coca-Cola Company introduced in January, 1956, a larger ten ounce bottle. Since then the two bottles continued to be sold by the Coca-Cola Company.

The bulk of the company's sales is made through soft drink dealers. Sales to ultimate consumers at wholesale prices are relatively insignificant. However, direct selling by the Coca-Cola Company on certain occasions, such as soccer games, is becoming of increasing importance. The soft drink dealer, nevertheless, remains the most important outlet.

Rapid expansion of the Company has been obstructed by many factors. Lack of bottles, which have to be imported from Egypt and Italy, is a major factor. This is even accentuated by a high rate of breakage. "Spotty" work performance is evident in many departments. A very slow pace of work is frequently observed

[1] Both Coca-Cola and Loiso limit their activities to Khartoum (the capital) and the surrounding areas. The Pepsi-Cola Company has attempted a wider distribution, but with little success. Poor transportation and warehousing facilities, high rate of bottle breakage, and other factors account for the reluctance of the major companies to canvass the national market more intensively. One illustration would convince the reader of the unique nature of the problem facing the modern bottler in this country.

Some time ago, the Coca-Cola Company ventured to extend its distribution to a small town a few hundred miles away from Khartoum. A modest shipment was made and a few men were sent to supervise the distribution. Officers of the firm were a bit surprised when repeat orders were not received. Then it was decided to send some men to investigate the matter. It turned out that local bottlers were using Coca-Cola bottles (bearing a registered trademark) in bottling their own drinks.

in loading, unloading, delivery, and the like ; whereas, on the production side the work pace is usually rather high.

III. THE METHODOLOGY

Nature of the Data

The Company provided data relating to its *physical* sales (in terms of cases of twenty-four bottles) over the period from January, 1956 to August, 1958. The monthly figures are for both the six ounce and the ten ounce bottles. The figures are for all territories and for two territories characterized by a marked difference in *per capita* income level.

It is important to point out that the monthly sales figures do not necessarily coincide with aggregate monthly consumer purchases. As mentioned above, the bulk of the sales is made to dealers, while a relatively small part is made to ultimate consumers. Dealers, however, usually keep a minimum of stock the duration of which is around forty-eight hours on the average. Indeed, Company salesmen call on dealers daily or at most every other day ; and on a rather hot day dealers' stock may be exhausted in a matter of hours.

Accordingly, while Company daily sales to dealers may differ significantly from consumer daily purchases, such differences tend to iron themselves out over a longer period, say a month.

Preliminary Treatment of Data

It is obvious that part of the variation in the monthly sales series is due to the variation in the length of the months. Thus, before attempting to isolate for purposes of study the different variables having a bearing on Company sales, it has been necessary to restate the data in more significant and usable terms.

Accordingly, the sales values of each month have been divided by the number of days in that month, thus expressing the data as cases of Coca-Cola per calendar day.

The Effect of Seasonality

In gauging the price-elasticity of the demand for Coca-Cola, it was necessary to isolate the effect of all variables other than price. Some difficulties, however, were encountered in attempting to isolate the effect of seasonality. Conventional statistical techniques used in the measurement of seasonal variations, such as the moving average method, could not be used in the present study for several reasons. First, the number of values in the series was not large enough to yield accurate results. Secondly, the impact of several seasonal factors was superimposed one on the other which made it very difficult to isolate entirely the seasonal element from the data.[1] Third, the impact of some variables such as Ramadan, Bairam[2] and Kurban[3] on sales has been rather erratic and inconsistent.

[1] Take, for instance, the impact of Ramadan, the Moslem calendar month in which Moslems fast every day from sunrise until sunset for a period of thirty days. The Moslem calendar is different from the Gregorian calendar and, therefore, the impact of Ramadan varies from one year to another. In one year Ramadan may fall in the winter, thus accentuating the impact of cool weather on Company sales. In another year Ramadan may fall in the summer, thus checking the favourable impact of the hot weather on Company sales.

[2] Bairam is a three-day Moslem festival held immediately upon the termination of Ramadan.

[3] Kurban Bairam is a four-day Moslem festival held about two months after Ramadan Bairam.

Because of the above difficulties, another method was used in isolating the effect of seasonality attributable to variations in temperature. Data on average daily sales and mean daily temperature for each month were first plotted on a simple arithmetic chart. A regression line was then fitted into the observations by the least-squares method, after exclusions of those observations that deviated too much from the regression line.

The regression value corresponding to each actual value was thus computed (Yc). The amount of explained variation was then computed by subtracting the mean of the actual values from each regression value ($Y_c - \bar{Y}$). Finally, the explained variation was subtracted algebraically from the actual values $[Y - (Y_c - \bar{Y})]$ to give the mean daily sales for each month after the exclusion of the effect of temperature.

The above seemed to be an important step in the isolation of the seasonal element as a result of the very high correlation existing between mean daily sales and mean daily temperature for each month.

The Effect of Trend

After the exclusion of the effect of temperature, a straight-line trend was fitted into the data. Again, the constant "b" was found by the least-squares method. The effect of trend from one month to another was found to be of minor importance.

The Effect of Price

To gauge the effect of price on sales the following procedure was used:

1. Company sales were recorded for the month preceding the major price rise, i.e. July, 1958; and for the month following the price rise, i.e. August, 1958. Fortunately, these two months were free from the effects of Ramadan, Bairam, and Kurban. None of the three Moslem occasions fell during that period.

2. The explained variation, computed in the manner indicated above, was subtracted from the two monthly values, thus eliminating the effect of temperature.

3. The trend constant "b" was deducted from the August, 1958, 'deseasonalized" mean daily sales figure.

4. The price elasticity of demand (η) was computed by dividing the relative change in quantity by the relative change in price: $= \frac{\Delta q}{\Delta p} \cdot \frac{P}{q}$

IV. FACTORS AFFECTING THE DEMAND FOR COCA-COLA

In this section an attempt is made to search out and measure the forces that determine the sales of Coca-Cola in the Sudan. Demand is analysed here as an effect of certain controlling effects, and not simply as historical patterns of sales behaviour broken into long-run trends, cyclical fluctuations, and seasonal variations.

Obviously, it will not be possible to list all the independent variables having a bearing on Coca-Cola sales. But a consideration of the most important variables may be adequate for the purpose of this study.

The Effect of Temperature

Temperature seems to be the most important independent variable affecting Coca-Cola sales, other things being equal. The overall mean daily temperature (centigrade) for each month was preferred to both the maximum mean temperature and the minimum mean temperature, since it has given consistently a higher coefficient of correlation with sales.

For the period from January, 1956 to August, 1958, the regression of mean daily sales on mean daily temperature for each month gives the results shown in Table 1.

TABLE 1

Regression of Monthly Mean Daily Sales (y)
on Monthly Mean Daily Temperature (x)

Bottle Size	Regression Equation	Standard Error of the estimate (cases)	Coefficient of Correlation
All bottles	$Yc = -664+50X$	73·83	0·940
10 oz. bottles	$Yc = -554+33{\cdot}6X$	29·68	0·975
6 oz. bottles	$Yc = -276+21{\cdot}5X$	57·59	0·815

It is obvious from Table 1 that temperature variability seems to explain a considerable part of the variance in Coca-Cola sales. Such a high correlation between temperature and sales seems to be peculiar to tropical under-developed countries where adequate air-conditioning facilities are almost entirely lacking.

A closer examination of the day-to-day relationships between temperature and sales reveals the existence of a time lag. A high temperature in a particular day does not affect substantially that day's sales, but the following day. The effect of high temperature is to exhaust dealers' stocks, which they try to replenish the following day. This reflects the practice of hand-to-mouth buying on the part of most dealers which is due to their reluctance to tie up a reasonable amount of capital in inventory. Balancing the loss of business against the cost of inventory is an unknown art among most dealers in this country.

The impact of temperature, however, is not the same on the sales of the two bottles. As Table 1 indicates, sales of the ten ounce bottle show a higher correlation with temperature than sales of the six ounce bottle. The accuracy of the regression equation is also greater in the case of the ten ounce bottle.

How may this be explained? Several hypotheses may be introduced in this respect. First, the two bottles may be used for somewhat different purposes. The large bottle may be used primarily to quench one's thirst, whereas, the small bottle may be offered in entertaining guests and for similar occasions. The higher price of the large bottle seems to support this hypothesis.[1]

[1] The habit of offering visitors "something" is very widespread in Middle Eastern countries. Almost all offices are serviced by a "buffet" and it is the custom to offer visitors coffee, tea, or any cold drink. The same is true for the "Cafés" where friends meet in the evening to chat and play some oriental games.

Second, the two bottles may be in a way consumed by two different classes of people, the small bottle may be largely consumed by expatriates and other upper income groups who work under different conditions from the other classes in relation to ventilation and air conditioning.

Third, the methodology used in fitting the regression line in the case of each bottle may explain the difference in their correlation coefficients. Thus, in the case of the large bottle four observations have been excluded from the analysis since they

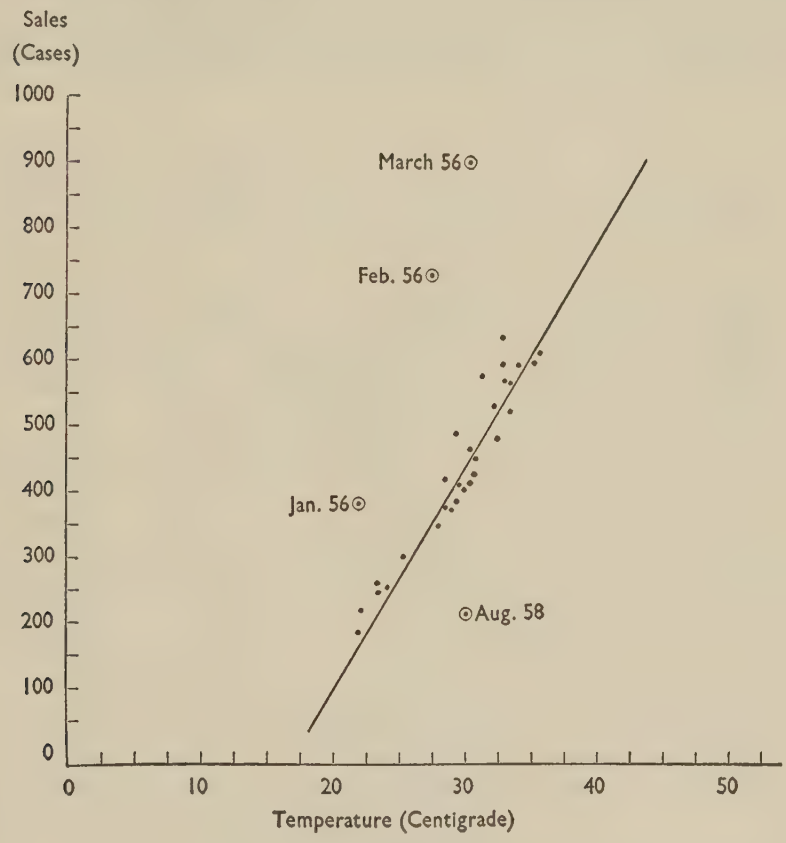

FIGURE 1

Regression of Mean Daily Sales on Mean Daily Temperature (ten ounce bottle)

deviated considerably from the regression line. This was not needed for the small bottle since none of the observations deviated significantly from the other observations in the scatter diagram.

The effect of temperature on sales, however, depends so much on the play of other independent variables. The correlation of temperature with sales is at best

when the influence of other variables is absent. Thus, sales campaigns, price, Moslem festivals and celebrations, and other variables tend to blur and distort the relation between sales and temperature. This is clearly shown in Figure 1.

The launching of the ten ounce bottle in January, 1956, in a spectacular fashion explains the diversion of the January, 1956, observation from the other observations. In February, 1956, the Company introduced a sales contest which had great success in the first two months. This again distorted the effect of temperature in these two months. In August, 1958, the sudden rise in the price of Coca-Cola (P.T. 12 per case) resulted in a sharp drop in sales and blurred the effect of temperature.

Figure 2 shows the regression of the sales of the six ounce bottle on temperature.

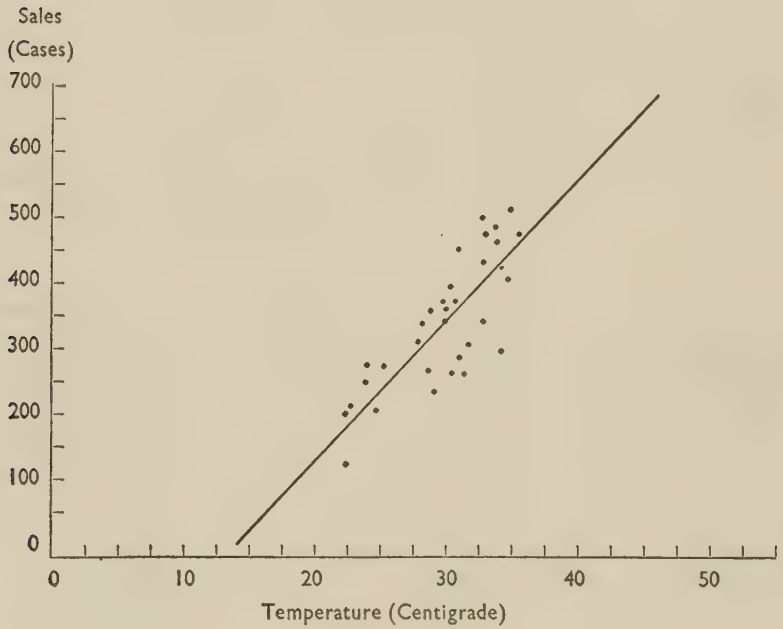

FIGURE 2

Regression of Mean Daily Sales on Mean Daily Temperature (six ounce bottle)

The impact of other variables is not so pronounced in the case of the six ounce bottle as indicated in Figure 2. The bulk of the promotional effort in 1956 centred on the ten ounce bottle. Furthermore, the production of the ten ounce bottle increased substantially at the expense of the six ounce bottle to conform to top management policy aimed at offering a product competing directly with the Pepsi-Cola. The price change (P.T. 10 per case) in Angust, 1958, has been less significant in its impact on sales compared with the ten ounce bottle. This reflects, as will be demonstrated later, a lower price-elasticity of demand for the small bottle.

What are the implications of the high correlation between sales and temperature?

Obviously the accuracy of the regression equation provides a useful forecasting tool for top management. This should help improve existing planning procedures to a great extent.

The regression equation may also provide a useful controlling device. The crude method of comparing this month's sales with the same month last year may be replaced by a more objective technique. An examination of temperature variability shows significant changes in mean daily temperature for each month from year to year. This makes a comparison of monthly sales from year to year rather misleading. Instead, a specific month's sales should be compared with the regression value for that month computed by substituting for the proper value for temperature.

The Effect of Sales Promotion

Sales promotional effort by the Coca-Cola Company has taken several forms. Outdoor and cinema advertising occupy the first place. Newspaper and magazine advertising schedules are very thin. A major sales contest was attempted in February, 1956, and was continued until June, 1956.

The experience of the Company with its sales effort seems to be rather peculiar. The spectacular launching of the ten ounce bottle in January, 1956, and the introduction of the sales contest in the following months were very successful, in spite of the downward seasonal effect in these three months. This was clearly shown in Figure 1. But this kind of promotional effort has failed to uplift sales to a new higher plateau. Thus, during the course of a campaign sales would increase, but once the campaign was over sales would come down to their normal level, or even to a lower level, as they did in the case of the sales contest.[1]

The failure of advertising and sales contests to raise sales to a new level may be attributed to a cultural lag. Brand consciousness is not so well developed in the Sudan. Consumers are accustomed to buying unpackaged goods and are exposed to a minimum of advertising. What advertising does exist is frequently alien to the local environment, the advertising material being prepared overseas.

The key factor in expanding the market share of a soft drink seller is the dealer. The latter has been significantly helped in occupying this position by the lack of brand consciousness on the part of the consumer. A typical consumer asks the dealer for a "cold drink". The consumer who has developed a brand preference would not insist, however, on a specific brand. He would not be very reluctant to accept a substitute drink suggested by the dealer.

All this means that the core of the market for a seller who relies exclusively on advertising is very thin. There is considerable evidence to support this hypothesis. A local bottler (The Loiso Company) has been able to increase its market share substantially by securing considerable dealer support. This has been basically accomplished by allowing dealers' margins significantly higher than those allowed

[1] Sales increased substantially in the first two months of the contest, then they tapered off gradually until they reached the normal level in the third month. When the contest was terminated, sales dropped even below the normal level.

The contest involved putting winning caps in some bottles which would entitle the winner to certain advertised prizes. The Government banned the contest later on when it was known that some dealers were examining bottle caps in their search for the winning ones ! For sanitary reasons alone, the Government could not tolerate this any longer.

by Coca-Cola or Pepsi-Cola. This success has been possible despite the use of antedated equipment and delivery facilities.

Effect of Income

It may be thought inconceivable that income variability would have a significant effect on the sales of a low-price soft drink. But available data prove the contrary.

Sales in the first two days and the last two days of a typical month are on the average seventy per cent higher than the mean daily sales for that month. This is easy to understand when it is known that "payday" for most wage earners in the Sudan is the thirtieth of the month. More significant, however, is the implication of this phenomenon ; namely, that Coca-Cola is consumed by the masses, and that expatriate and upper-income group consumption is not a controlling factor.

Basic differences between income levels in different territories affects the price-elasticity of demand in these territories. Thus, as will be demonstrated later on, the price-elasticity of demand for Coca-Cola is lower in higher-income territories than in lower-income territories.

Effect of Moslem Festivities

Moslem festivities seem to play an important part in affecting Coca-Cola sales, at least in certain territories.[1]

Ramadan certainly has a downward effect on Coca-Cola sales. But it may be rather difficult to measure the exact effect of Ramadan on sales since it seldom coincides with a month of the Gregorian calendar. However, Ramadan of 1957 (April 1st to April 29th) provides a reasonable basis for gauging the effect of Ramadan on sales.

Data on mean daily sales for each month have been adjusted for temperature variability in the manner described in the Section on Methodology. A straight-line trend was then fitted into the adjusted sales data. The data were then adjusted for trend. Sales data adjusted for temperature and trend for three April months are as follows :

April, 1956 = 822 cases.
April, 1957 = 759 cases.
April, 1958 = 823 cases.

Each of April, 1956 and April, 1958, comprised twenty days of Ramadan, whereas April, 1957, contained thirty days of Ramadan. Discounting the influence of other variables, none of which is of great importance in this respect, the effect of ten days of Ramadan is to lower the mean daily sales by about sixty-four cases. The total effect of Ramadan, according to this reasoning, is to decrease mean daily sales for a given month by about 192 cases. This is a drop of about twenty-seven per cent of the mean daily sales per month for the period covered by the study.

The effect of Bairam is not as pronounced as Ramadan. Nevertheless, the few days of each Bairam tend to uplift sales significantly. The actual effect is very difficult to assess with any degree of reasonable accuracy. However, an idea may be

[1] Moslem festivities are : (1) Ramadan, a thirty-day month of the Moslem calendar in which Moslems fast each day from sunrise until sunset. (2) Ramadan Bairam, a three-day celebration after Ramadan is over. (3) Kurban Bairam, a four-day celebration two months after Ramadan Bairam. (4) The Mulid, which is Mohammed's birthday.

obtained about the magnitude of the effect of each Bairam by a careful examination of the diagram in Figure 3.

The difference in the magnitude of the fluctuations in mean daily sales before and after the elimination of the effect of temperature is portrayed in Figure 3. It is also shown how the superimposition of the effect of Bairams on the effect of temperature (during the hot months) magnifies the fluctuations in sales.

After the isolation of the effect of temperature, the effect of Ramadan (R), Ramadan Bairam (B_1), and Kurban Bairam (B_2) is clearly demonstrated. However, the magnitude of the effect is not consistent from year to year. Thus, in 1957 the effect of B_1 and B_2 was more pronounced than in both 1956 and 1958.

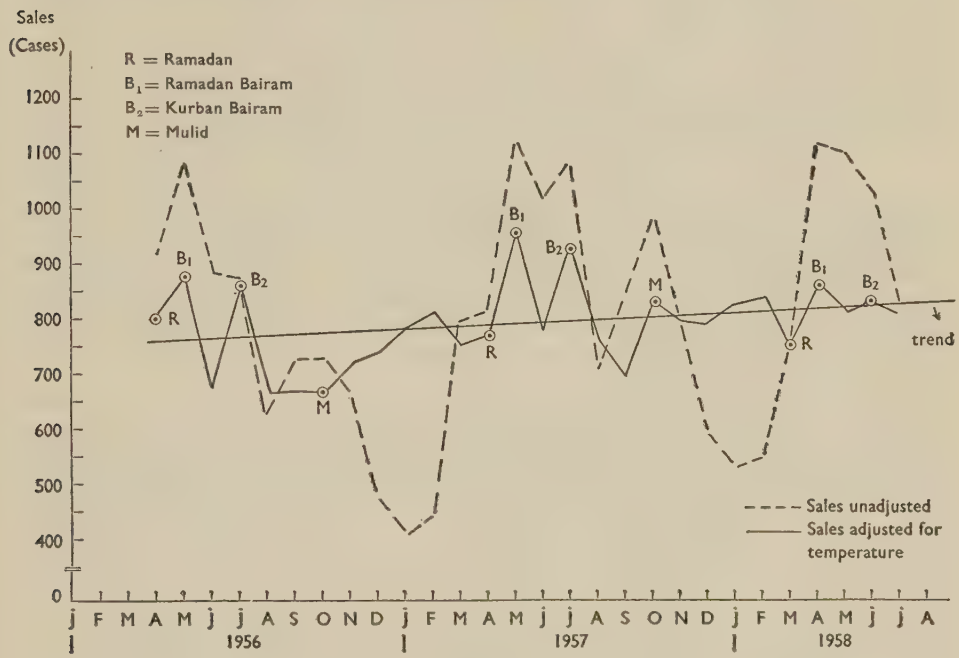

FIGURE 3

Coca-Cola Sales Adjusted for
Variations in Temperature
(10 and 6 oz. Bottles)

The effect of B_1 seems to be consistently more powerful than B_2, although the difference is not highly significant. The fact that B_1 comes after a long period of fasting may provide some explanation for this difference.

The impact of the Mulid is not as definite as Bairam. No consistency exists for the two observations in 1956 and 1957.[1] But discussions with Coca-Cola sales

[1] The Mulid in 1958 occurred on September 26th which is not shown in Figure 3, since data for that month were not available at the time the study was undertaken.

personnel indicated a significant effect, especially in native residential quarters. The Mulid, moreover, should not be conceived of as one particular day. In the Sudan, the Mulid celebrations extend for almost a week.

The Effect of Competition

Competition is another factor affecting Coca-Cola sales in the Sudan. Price competition is completely non-existent. Non-price competition takes many forms such as advertising, participation in civic activities, contests of many types, and other sales promotional efforts.

Dealer support, as mentioned already, is of crucial importance. Leading firms do everything possible to obtain dealer support, e.g. providing adequate servicing, selling ice-boxes at very convenient terms, and the like. But experience has shown that the margin allowed to the dealer is of prime importance.

A quantitative assessment of the impact of competition on Coca-Cola sales is not possible because of the lack of adequate statistics, especially data relating to the distribution of market shares among the leading firms in the industry.

A change in dealers' margin structure after the P.T. 2 price rise, due to higher cost of sugar, etc., has, however, given some indication about the relative strength of dealer support. Thus, several dealers at that time virtually stopped stocking Coca-Cola because of the relatively low margin allowed to the dealer on this brand. The Loiso position improved substantially because of a relative increase in its margin to the dealer. There is no quantitative estimate of these results, however. They are merely inferences based on discussions with sales personnel and a small non-random sample of dealers.

The Effect of Price

Price is a major determinant of Coca-Cola sales, at least in certain territories and for the ten ounce bottle. However, price rigidity is a basic characteristic of the industry. But the imposition of a P.T. 12 excise duty and the corresponding sharp rise in prices has made it possible to assess quantitatively the effect of price. This is demonstrated in detail in the next section.

V. THE PRICE-ELASTICITY OF COCA-COLA SALES

Two attempts have been made to gauge the responsiveness of Coca-Cola sales to price variations. It must be emphasized here that the price variations refer only to wholesale prices, i.e. the price at which the company sells to dealers. Relative changes in Coca-Cola sales to dealers ought to be matched with relative changes in dealers' prices (wholesale prices) rather than with relative changes in consumer prices, i.e. retail prices.

The sales-responsiveness test was made in respect to two price variations; a minor one, and a major one.

Minor Price Variation

The minor price variation, as mentioned above, occurred as a result of the increase in the tax on sugar and petrol in the middle of July, 1958.

The retail and wholesale prices, as well as the dealer's margin, for the three leading brands before and after the minor price change were as given in Table 2.

TABLE 2

Prices and Margins Before and After
Minor Price Change (Prices in P.T. for a case of 24 bottles)

Brand	Before Price Change			After Price Change		
	Retail	Wholesale	Margin	Retail	Wholesale	Margin
Coca-Cola (6·5 ozs).	36	27	9	36	29	7
Coca-Cola (10 ozs.)	48	36	12	48	38	10
Pepsi-Cola (10ozs.)	48	36	12	48	38	10
Loiso (7 ozs.)	48	32	16	48	34	14

It is obvious that the minor increase in price was not passed on to the ultimate consumer, except in very few individual cases. Accordingly, what might be tested in this respect is simply the responsiveness of Coca-Cola sales to the change in dealer's margin, i.e. the margin-elasticity of Coca-Cola sales.

The statistical technique described in the section on methodology did not yield consistent results in this respect. Indeed, the findings did not portray a consistent relationship between sales and the change in dealer's margin for the two bottles, and for different territories.

The failure to arrive at a consistent pattern was probably due to two main factors. First, in comparing Coca-Cola sales in the thirty days before and after the price increase (16th June, 1958), it was not possible to hold all other relevant variables constant. It was possible to isolate and eliminate the effect of temperature and trend. But it was not possible to isolate and eliminate with any degree of accuracy the effect of Kurban Bairam (26th June to 30th June). In the second place, some basic changes were introduced in the management of the Coca-Cola Company during that period. New developments such as the allocation of sales effort, rerouting, and the like, took place.

All this has made it very difficult to assess objectively the pattern of sales behaviour in response to the change in dealers' margin. Subsequently, no attempt is made here to explore this pattern or to analyse the relationship between sales and the margin change. However, non-random interviewing of a sample of dealers and consumers indicated that in several situations the dealer had stopped stocking Coca-Cola after the decline in the margin. Many said that it had become much more profitable to handle the Loiso brand.

The situation, however, was changed shortly afterward when another major price rise took place. Again, the competitive margin structure witnessed another important change.

Major Price Variation

On 1st August, 1958, the Government imposed an excise duty of P.T. 12 on every case of twenty-four bottles of carbonized soft drinks. The announcement concerning the tax was made a little earlier, however. This introduced some complexity into the analysis since dealers began to stock up in anticipation of the price rise. Furthermore, a lockout, from 1st August to 6th August, was called by

the three major bottlers in protest against the excise duty. When production was resumed on 7th August, the impact of the price rise was not completely felt because of the backlog in demand.

To take care of the above difficulties, the last few days of July, 1958, and the first few days following the end of the lockout have been excluded from the analysis. Other than that, the comparison of mean daily sales in July, 1958 with August, 1958 (after adjusting for the effect of temperature and trend) provided a reasonable basis for assessing the impact of the price rise. As mentioned already, the play of other variables such as Moslem festivities and the like had been largely absent.

Table 3 shows the price and margin structure after the major price change. It may be noticed from Table 3 that both Coca-Cola (6 oz. bottle) and Loiso absorbed P.T.2 of the excise duty in order to improve the dealer's margin. This is another variable the effect of which was difficult to measure and isolate.

TABLE 3

Prices and Margins Before and After Major Price Change
(Prices in P.T. for a Case of 24 bottles)

Brand	Before Price Change			After Price Change		
	Retail	Wholesale	Margin	Retail	Wholesale	Margin
Coca-Cola (6·5 oz.)	36	29	7	48	39	9
Coca-Cola (10 oz.)	48	38	10	60	50	10
Pepsi-Cola (10 oz.)	48	38	10	60	50	10
Loiso (7 oz.)	48	34	14	60	44	16

Price Elasticity by Bottle Size

A separate analysis was made for the price-elasticity of the ten ounce and the six ounce bottle. Table 4 summarizes the findings derived from this analysis.

TABLE 4

Price-Elasticities for 10 oz. and 6 oz. Bottles

Item	10 oz. Bottle	6 oz. Bottle
Mean daily sales, July, 1958, adjusted for temperature (q)	353·48 cases	360·09 cases
Mean daily sales, August, 1958, adjusted for temperature and trend (q^1) ..	192·24 cases	252·36 cases
Net change in sales ($\triangle q$)	—161·00 cases	—107·73 cases
Net change in price ($\triangle p$)	12·00 P.T.	10·00 P.T.
Price-elasticity (η)	—1·44	—0·8676

The price elasticity for the ten ounce bottle is more than unity, whereas for the six ounce bottle it is less than unity. The finding is a bit surprising, and it reflects an important proposition, namely, that the Coca-Cola Company may be in effect selling two different products. It may be that there are two different demand schedules for Coca-Cola, or perhaps more demand schedules if we take cognizance of the responsiveness of sales to the price change in different territories, as will be pointed out very shortly.

The small bottle may be consumed by a different class of people, e.g. upper-income group such as expatriates. Or, it may be consumed by the same consumers of the ten ounce bottle but on different occasions, e.g. movies, clubs, cafés, and the like.

Another proposition is that some consumers may have dropped out of the small bottle market as compared with the large bottle after the price change. The increase in the retail price of each bottle, however, has been the same, i.e. a half Piastre in each case. But the retail price level has not been the same, being P.T. 2·5 for the ten ounce bottle and P.T. 2 for the six ounce bottle. It may just be that P.T. 2·5 is too high a price to pay for a bottle of soft drink. This, however, should only be true for consumers in the lower-income groups.

Another proposition is that the improvement in the dealer's margin on the small bottle (P.T. 2 increase per case) may have been a factor resisting the decline in the sales of this bottle after the price rise. In absolute sense the margin on the six ounce bottle (P.T. 9) is smaller than that on the large bottle (P.T. 10); but as a per cent of the dealer's investment in inventory, the margin on the small bottle (9/39) is considerably larger than that on the large bottle (10/50).

Several other propositions may be presented to explain the difference in the price-elasticities of the sales of the two bottles. But further empirical evidence is needed before one may be inclined to accept any of these propositions. This, however, is beyond the scope of this study.

The significance of the difference in the price-elasticities of the two bottles is not, however, seriously impaired by the lack of a rigorous proposition explaining this difference. The varying elasticities offer important implications and suggestions regarding company production and sales policies, and should also be illuminating insofar as tax policy is concerned. This latter question will be considered in the last section of this paper.

Price Elasticity by Territories

The structure of the capital of Sudan (Khartoum) enabled the assessment of price-elasticities of Coca-Cola sales in territories with varying backgrounds in terms of income, social structure, and other characteristics.[1] Therefore, an attempt was made to measure the price-elasticities of Coca-Cola sales in two contrasting markets, namely, Khartoum proper and Omdurman. A summary of the findings of this analysis is given in Table 5.

[1] The capital consists of three towns: (1) Khartoum proper; (2) Omdurman; and (3) Khartoum North. Khartoum proper is the residence of expatriates and other upper-income groups. Omdurman is largely inhabited by Sudanese, the majority being of the middle- and lower-income groups.

TABLE 5
Price Elasticity by Bottle Size and Territory

Bottle Size	Price Elasticity (η)	
	Khartoum	Omdurman
10 oz. bottle	— 0·63	— 1·65
6 oz. bottle	— 0·46	— 0·89

It is obvious from Table 5 that the responsiveness of sales to the price rise in the territory characterized by low *per capita* income level has been much more pronounced than in Khartoum proper, where *per capita* income is probably the highest for the entire country. The income effect seems to be operating for both the large and the small bottle.

The above findings yield more evidence as to the importance of income in determining the sales of such a low-priced soft drink. They also suggest that the Coca-Cola Company is probably confronted with a series of sales schedules, each of which corresponds to specific important circumstances. The implications of these propositions for management policies and for future taxation need no elaboration in this respect.

Some Limitations

Two important limitations must be borne in mind in respect to the measurement technique described in the section on methodology and elsewhere in the paper. First, what has been measured may actually be the immediate responsiveness of sales to the price change. If more time was allowed after the price change, the result would probably be different. Demand may have adjusted itself to the price increase one way or another. In effect, what has been measured in this paper may be nothing more than an approximation to the *very short-run* price-elasticity.

In the second place, the improvement in the dealer's margin for the small bottle may imply that the price elasticity for this bottle is actually underestimated. Sales of the small bottle might have dwindled more sharply if dealer's margin remained unchanged.

VI. A CRITIQUE ON THE EXCISE DUTY

In the light of the analysis and findings presented in this paper, the excise duty levied by the Government may be criticized on at least three basic grounds :

1. From the consumer's point of view the excise duty is inequitable. The product is consumed by the masses as well as the upper-income group. But the burden of the tax is certainly considerably higher on the lower-income groups.

2. From the management and ownership viewpoint, the tax would yield bad results in terms of increased idle capacity and mounting burden of overhead. Total revenue from the ten ounce bottle should suffer a serious drop, since the price-elasticity for this bottle is more than unity. Revenue from the six ounce bottle may

not be affected (price elasticity close to unity). If the results arrived at in this study depict the behaviour of Pepsi-Cola sales, this would mean a serious blow to the soft drink industry in the Sudan.

3. From the Government's viewpoint, a distinction should have been made between the small and the large bottle, if the tax proceeds were to be maximized. This could have been achieved by levying a relatively higher tax on the six ounce bottle than on the ten ounce bottle.

It is also interesting to note in this respect that the Government possesses a sugar monopoly in the Sudan. Accordingly, the decline in soft-drink sales may affect the profits realized by the sugar monopoly. However, this may not be true if consumers switched from carbonized soft drinks to other soft drinks, the preparation of which uses sugar as an ingredient, e.g. lemonade.

VII. CONCLUSIONS

The demand for soft drinks in the Sudan is a function of several important variables. Temperature, sales promotion, Moslem festivities, income, competition and price are all important determinants of soft-drink sales. However, they vary in their relative importance; furthermore, their impact is tempered by some unique characteristics of the Sudanese market.

The sudden sharp price increase caused by the imposition of a Government excise duty afforded an opportunity to gauge the price-elasticity of Coca-Cola sales. Different results were obtained for different sizes of bottles and for territories with varying backgrounds. Discrepancies in price-elasticities of sales reflect important implications for policy makers.

The price-elasticities of Coca-Cola sales also point out some critical weaknesses in the Government policy regarding the levy of the excise duty. There is some evidence that the tax has not been in the best interest of the three parties concerned, namely, the consumer, the business, and the Government.

Final judgment regarding the findings of this study must in all cases be tempered with the reservations and limitations stressed throughout this paper.

SOME NOTES ON THE DISTRIBUTION OF THE NILOTIC PEOPLES IN THE MID-NINETEENTH CENTURY

by

Fr. G. Beltrame

[Giovanni Beltrame (1824-1906) worked as a missionary in the Sudan from 1853 to 1860. In December 1859 he sailed up the White Nile to visit the mission at Gondokoro. The notes which follow have been extracted from his account of this journey. Much merely topographical material has been omitted; but it is thought that Fr. Beltrame's observations on the location and distribution of the Nilotic peoples may be of interest to anthropologists and ethno-historians—Ed., *SNR*.]

[Father Beltrame reaches Jebelein, on the threshold of Nilotic territory, early in December, 1859.]

. . . These particular mountains, known as "Jebelein" to the Arabs, are situated between 12° and 13° N., and are called Niemati by the furthermost Dinka tribe, the Abialang, who are the closest to them. The Arabs call them Gebal or Giobal-ed-Dinka since once the Dinka extended as far as these mountains, but, as they were being constantly harassed by the Abu-Rof Arabs, they retreated to the 11° N. and from there they now extend as far as the capital town of the Shilluk at 9° 50′ N., not far from the river Jal at 10° 19′ 54″ N. My old interpreter told me that about thirty years before the Dinka also inhabited the right bank of the White Nile as far as the Sobat, but they had had to withdraw from there too for fear of the Nuer by whom they were being constantly attacked. Nowadays, the Abu-Rof make frequent raids on horse-back among the Abialang, the Agher, to the south of the Abialang, and even among the Abujo, to the south of the Agher, in order to steal durra, of which there is abundance among the Dinka. These Dinka, together with the Agnarquei and the Dunghiol, who are more to the south, must also be in constant fear of the Shilluk who, on the same latitude, inhabit the opposite bank of the river. This native tribe is called Dinka by the Arabs of the Sennaar peninsula, while by the Arabs who inhabit the left bank of the White Nile it is called Gianghé. The natives, however, call themselves Gien and this name is given to all the other tribes that speak the Dinka language, although each one has its own particular local name. The Shilluk and the Nuer are, therefore, not included in the name of Gien. At the time of writing, the Dinka of whom I am speaking, were still in their permanent dwellings, in the interior.

The Shilluk tribe lives along the left bank of the White Nile, on the same latitude as the Dinka and continues almost as far as 9° N. Beginning from the river Sobat, their villages are very frequent and close to one another for about twenty geographical miles. My crew counted in this tract more than one hundred and fifty villages besides those which, they told me, could not be seen as they were further inland. It is true that many wandering Shilluk, given to fishing and hunting, are to be found as far as 14° N., but the true location of this tribe is between 12° and 9° N.

On 7th December [1859], at about noon, we reached Denab. I consider this town to be the capital of the Shilluk country rather than Hella-el-Kaka for it is more to the centre of the country. Also it is the residence of the Reth Mievdòk, and is inhabited entirely by Shilluk whereas Hella-el-Kaka is a mixture in which families of many diverse tribes are to be found. When we arrived, we found that the King of the Shilluk, Mievdòk, had died in February of that year. We also learned that when about to die he had been throttled by his relatives as in this tribe it is considered unworthy for a man of such rank to die by himself. He lay still unburied, well shut up inside a hut, as his successor—who would probably be the son of one of his brothers—had not yet been definitely elected. Such a nomination depends on the vote of the people and only when the successor is established in his post is the deceased Reth buried. All this was related to us by an old Shilluk who was unhappy about the new election, considering it much better to be without a king altogether.

* * * * *

On 8th December, at nine in the morning, we reached the last limit of the Shilluk country and soon came across the villages of the Gianghé tribe which separates the Shilluk from the Nuer.

At noon on the following day we reached the mouth of the Bahr-el-Ghazal, at 9° 18′ 24″ N.

* * * * *

On 17th December, at four in the afternoon, we entered the land of the Kic or Kiec. Kic, or Kiec, are living along the banks of the Bahr-el-Abiad, or White Nile, between 6° and 8° N. The name Kic which I have found written on many maps to the right of the river, should be placed to the left, for their permanent dwellings are to be found on the left bank of the river, a little inland. I myself, together with Fr. Joseph Lanz and Fr. Daniele Comboni, visited some of their villages. It is only temporarily, during the dry season, that they come to the river bank—and sometimes even cross to the other side—for the sake of good pastures. A few Kic, or Kiec, mostly fishermen, are permanently settled on the right bank.

* * * * *

At about four o'clock in the afternoon of 29th December we left behind us the Aliab and the Bor countries. These limits also mark the end of the region in which the Dinka language is spoken by at least eighteen tribes.

On the left bank of the river we find :

1. The Aliab, below 6° N.
2. The Atuot.
3. The Kic, or Kiec, between 6° and 8° N.
4. The Ghok.
5. The Arol, to the north of, and contiguous to the Ghok.
6. The great Nuer tribe, to the north of the Kiec, and widely spread over both sides of the river, speaking a language of its own but knowing also and using that of the Dinka.

7. The Gianghé tribe, which inhabits the left banks of both the White Nile and the Ghazal, between the Nuer and the Shilluk, and extends well into the interior.

8. The Shilluk tribe, between 12° and 9° N. speaking a language of its own but knowing, and using, that of the Dinka (the tribes which speak the Dinka language, although occasionally at war amongst themselves, recognize a certain brotherhood. The Shilluk and Nuer always consider the Dinka their enemies and are always ready to invade their lands and steal their possessions).

On the right of the river we find the following :—

9. The Bor between 6° and 7° N.

10. The Tui, to the north of, and contiguous to the Bor.

Always to the right of the river, from the Sobat to past 11° N., we find the true Dinka tribes ;

11. The Dunghiol.

12. The Agnarquei.

13. The Abujo.

14. The Agher.

15. The Abialang.

All these are small tribes which I, with the late Fr. Angelo Melotto, visited on my return from Holy Cross to Khartoum in February and March, 1860.

The wife of my interpreter told me of three other Dinka-speaking tribes, situated in the interior at 10° N.

16. The Gniel.

17. The Beer.

18. The Jom.

As well as these eighteen tribes, whose geographical position I was able to ascertain, there are others speaking the Dinka language to be found in the upper part of the Sobat and of the Bahr-el-Ghazal.

From what has been so far discovered, the Dinka language is the most spoken in the region of the upper Nile. The differences in the language as spoken by the various tribes are very small and those in the pronunciation even more negligible, so that, as I myself was able to ascertain during my study of this language, if one was well acquainted with the language of any one of the tribes mentioned above, it was quite easy to make oneself understood by the other tribes. Proof of this is that my interpreter, himself a Dunghiol, could easily understand and make himself understood by any of the tribes, the Shilluk, the Gianghé, the Nuer, the Kic, the Arol, the Ghok, the Aliab, the Bor and the Tui. The modest results of my work on this language consist of a dictionary of 2,692 words from Italian into Dinka and of 2,212 words from Dinka into Italian, the latter accented and with illustrated examples ; *Exercises and Dialogues* on the habits of the Kiec, and *General Rules of Grammar*. With this work, carried out over a period of two years, I have tried to organize the Dinka language as spoken by so many tribes.

On 29th December, just before we had passed the island of the Aliab, we noticed two great channels of water, which had left the river at 5° N., flow back into the White Nile. These navigable channels intercommunicate, forming extremely fertile islets, and belong to the Shir. These islets are sown with tobacco, sesame, beans, durra and cotton, and we noticed thick clusters of the castor-oil plant, which grows there naturally. Some of the islets are left uncultivated to provide pasture for cattle. The three main channels into which the river divides at about 5° N. are almost totally hemmed in by thick forests, and in these the Shir have their permanent dwellings during the rainy season, transferring themselves to the islands during the dry season for the sake of the pastures. We often met natives resting in the shade of huge old trees, looking after their animals, or others guiding cattle across the river or channels to better pastures on neighbouring islands. There were always groups of natives ready to entertain us with clapping, songs and dances in the hope of obtaining a few coloured beads. All this contributed to the splendid panoramas offered to our eyes, for indeed the Shir country is an enchantment of nature ! Even the language spoken by the natives—the Bari language—is beautiful and harmonious.

AN IMPRESSION OF THE NUBA AND THEIR COUNTRY IN 1875

by

Fr. G. Martini

I. THE COUNTRY

Gebel Delen [Dilling] is a group of five mountains of medium height, situated to the northeast; and their masses of granite form arid summits, vast caves, and strange gullies and steep slopes. Wherever there is soil, the wild fig tree can be found with large leaves, similar to those of the ivy. Only three of the five mountains are inhabited. The dwelling places are small round huts, made of earth and maize straw, and covered with grass. The outhouses are simply formed by poles stuck into the ground without any lateral walls, with flat roofs under which the inhabitants shelter during the heat of the day. The corn is stored in large earthen jars. Hedges, formed by high thorns, protect the herds of goats and cows from the nocturnal attacks of wild animals. These small dwelling places, which are dotted here and there in the shade of wild fig trees on the slopes of these bare-topped mountains, form a strange picture. In the valleys, at the foot of the mountains, there are stretches of ground, clear of trees and cultivated. According to the inhabitants, if the rainfall is normal the soil is very fertile and yields rich crops of cotton, fodder, vegetables, and sesame. Once the rains are over water, so necessary to life, industry and agriculture, is scarce everywhere. To obtain the minimum quantity of water necessary to live, one must go on a quarter of an hour's journey and draw from wells near a dried-up stream. When it is very dry, one has to dig between 14 and 16 metres deep before reaching water in these wells.

II. NUBA RELIGION

They are neither Moslem nor Idolaters. They have their own religion made up of different ceremonies, which they believe to honour "one only God, sovereign ruler and provider of all things on earth", as well as some of the protecting spirits. It seems probable that their forefathers, who once inhabited Nubia, and who came to these mountains after the Arab emigration from Hediaz [Hijaz] were Christians. Their religious ceremonies are celebrated by the Cogiurs [Kujurs] of whom there are five at Delen [Dilling]. One of these is also head of the Government and only officiates on very solemn occasions affecting the interests of the entire tribe. They have no temples, but each Cogiur has his own hut which is reserved for religious ceremonies. Inside the hut four poles are fixed into the floor, about a metre high, and planks of wood are fixed across forming a narrow platform. On the side of the hut there hang several cow skulls, the use of which is unknown to me. Here is the way the religious ceremony is performed: All the tribe remain outside the hut; the Cogiur steps on to the platform and lies down on it. He begins to blow heavily, turning from one side to the other. After a short while his face begins to get red, his eyes widen, and he lets out several heavy groans. Gradually, he raises his voice, shouts and emits curious shrieks. All this time he is twisting and turning, foam gathering round his mouth, and his voice becoming hoarse. At this point, the spirit entirely possesses the Cogiur. The tribe, standing silently nearby, await the oracle. A representative of the Cogiur stands at the door of the hut to hear what he

is saying. Then in a heavy voice, repeating several times, he begins to speak according to the circumstances, reprimanding the people for their faults, foretelling the future, giving answers according to the intention of the ceremony. The word of the Cogiur, whilst possessed by the spirit, is sacrosanct to everyone, and it is received with great faith and respect. When he has finished speaking, the Cogiur remains lying down for a short while, then jumps to his feet as if coming out from a deep sleep. As if he did not know what the spirit made him say, the Cogiur listens to his representative who tells him what has taken place. It is not clear what is meant here by "spirit". Each Cogiur has his own, and the Great Cogiur, in addition to his special spirit, is assisted by those of the other Cogiurs who are in the hut where the ceremony is held. Often these ceremonies end with an orgy of merissa (beer made from fermented grain) so that disorderly scenes of drunkenness follow in the wake of the religious ceremonies. These ceremonies are very frequent and they govern both public and private affairs. Here are a few examples which I will describe in detail.

At the beginning of the May moon, the rains commence, and the Ibis is seen. As this bird is the signal for the coming of the rains, it is joyfully greeted, and is a happy event for all. As soon as the Ibis has been seen, the Great Cogiur is informed and he watches until it alights near the huts. He then has a bowl of water placed under the bird. Naturally, the Ibis looks down, and resumes its flight. The Nubas say, that by this act of lowering its head, the Ibis blesses the water so that it may be abundant, rendering the fields fertile. The Great Cogiur, assisted by his representative and lesser Cogiurs, mounts the platform, and possessed by the spirit, speaks of the coming rain, in the presence of the elders of the country who are eager to attend this ceremony held at daybreak. During the evening of the same day, all the heads of the families bring the Coguir half a gourd of grain and sit round him in a circle. Then one of the lesser Cogiurs enters the circle, takes the grain from the gourds and puts it into a large vase, mixing it together. This completed, he picks out a handful of grain and places it in half a gourd. At the same time, two other Cogiurs take half a gourd of water and half a gourd of merissa ; then the Great Cogiur stands up and, followed by all, walks a short distance towards the thorn hedge which surrounds the dwelling places. There the elders dig a hole in the ground and the Great Cogiur places the grain into it. Then, taking the half gourd of merissa, he raises it to his lips, without however drinking any, and empties it over the grain. At the same time, some of the elders come forward, and they cut the neck of a chicken over the grain, taking great care that all its blood drops onto the grain. Finally, the whole is covered and the Great Cogiur washes his hands in water over it. This formality is repreated every day until the seed has grown to a certain height.

Once the ceremony is over, they all return with the Great Cogiur to his house and drink merissa until they are drunk. If the seed grows, it means that there will be a good harvest that year ; if not, it means that it will be a lean year. If, after the first rainfall and when the ground has been sown, there elapse fifteen or twenty days without further rainfall and the harvest is endangered, another ceremony is held.

The women, festively clad, are summoned by the sounding of the drum, and go in procession to the Cogiurs visiting the Chief first. Along the way, they emit piercing shrieks, similar to that of the Cogiurs, and they violently strike their throats. On arriving at the Cogiurs, the hut to be used for the religious ceremony is immediately closed. The women continue to shout and beat on the outside, and then they prepare to dance. They dance in the following way : one of the women hops a little distance away with her feet together, and clenching her hands she clasps

her body with her arms ; then, slightly bending the knees and raising the hands above her head, she makes quite a high jump, which she repeats three or four times ; this is then taken up by another. Once the dance is over the shouting ceases. Then one of the women, accompanied by the clapping of hands, begins to sing the praises of the spirit of the Cogiur. This song is taken up by all the women. The Cogiur is then begged to consult the spirit. Whilst the Cogiur lies shouting on his platform, the women continue to yell and sing until the hoarse voice of the priest tells them that he is ready to speak. He reminds the people that in their misery, they must think of God, of the spirits, and of the Cogiurs ; but as they had not done so they had incurred the wrath of heaven, drought, hunger, and all evil. Drawing a comparison between the riches and wealth of the past and the present poverty, he says that the tribe is suffering thus because it has not faithfully observed the religion of the forefathers or followed the precepts and customs of the Moslems. He concludes the ceremony by promising rain for the following day. If all the Cogiurs, or the greater part of them, hold forth the same hope, then the dancing, shouting and singing go on until nightfall and start again the following day. I must point out here, that although these people are not Moslems, they have a great inclination for the precept and customs of the Muhammadans as they see these practised by the Baggara. Many of these, when they go to fight and plunder the Nuba in the mountains, have tied on their arm and neck pieces of paper covered with Arabic characters written by the Fakirs [Fikis]. These are worn as talismans, not only to guard them from danger, but to ward off the spears and bullets of their enemies. I myself saw one of these Fakirs writing a few words on a piece of wood. The words were then scraped off and mixed with some water which was given to an invalid, who, full of faith, drank it and paid well for it. The Nuba have learnt from the Moslems to swear by the Koran, to weep for the dead, to call Muhammad the Prophet of God, and some other things.

III. NUBA POLITICAL INSTITUTIONS

The inhabitants of Delen [Dilling], like the greater part of the Nuba people, pay a small tax to the Viceroy of Egypt, who, as regards everything else, gives them complete freedom of government. The Government of the Nuba is a kind of republic, presided over by the Great Cogiur. A little common sense, strength and fear, are all that constitute its legal code. The ruling of the Cogiur is always sought in differences between interested parties. Often, however, the people reach a settlement among themselves or through the help of their neighbours. They rarely make use of their sticks, and less still of their knives and spears. If perchance one of them is killed, his family holds itself responsible for taking revenge by seeking the life of the killer. The latter, knowing full well that he can no longer stay in his native country, escapes and seeks refuge among some other friendly tribe. It is certain that the rancour towards him will remain hereditary in his victim's family. Up to the third generation, the sons believe it to be an honour for them to kill the persons responsible for the death of their great-grandfather. The Great Cogiur has the right to declare war, or make peace with the enemy after having previously conferred with his Senate, which is composed of the elders of the country. In the event of war, all the young and sturdy men are mobilized. If during the war the mountain is attacked, even the old men take up their arms ; and, shouting, they hurl themselves *en masse* against the enemy. At the beginning of hostilities, twenty or thirty young men, armed with spears and rifles, hide in the forests of the nearby mountains, and when they are ready they seize the horses, cows, sheep, and if they

can, children, women and soldiers. If the tribe becomes aware of such an attack, they sound the call to arms and throw themselves at the attackers who either flee or, if in sufficient numbers, give battle, killing without quarter, and above all, endeavouring to capture slaves. These slaves are then taken to the Cogiur, who makes his choice, leaving the rest to the victors. The parents of these unfortunate beings hurriedly barter for their release with cows, goats and grain, otherwise they are taken to El Obeid and sold to the slave traders. Sometimes instead of selling them they are kept in the house and are made to till the soil. In such cases, they are treated like any other member of the family. Owner and slave work together and eat the same food. The slaves, like the others, take an equal part in the tribal festivities ; but so that they shall not escape, an iron or wooden ring is placed round their neck. A long wooden stick is fixed to this ring and sometimes it is tied to a stake. Sometimes hostilities between the tribes last for several years, until one of them sues for peace. Once peace has been established, the tribes respect and help each other until some future event breaks the peace once again. Both peace and war are solemnly announced to the tribe by the Great Cogiur. In the evening towards nightfall, or at early daybreak, the Cogiur, who normally lives in the more thickly populated part of the mountain, stands on top of a high stone and for a few minutes sings at the top of his voice. As soon as the Nuba hear this song they hurry out of their houses, and silently await the word of their chief. After a moment's rest, the Cogiur breaks the news of peace or war, and gives what advice he thinks necessary. The Great Cogiur does not live in any great luxury ; he has no need of material means to exact obedience ; he does not levy any taxes, he has no prisons or gallows. He is like a father who with all his heart desires the good of all his tribe. Before giving any outstanding order he consults the elders and respects the majority of their vote, and announces the decisions reached to the tribe. His words become law. If, at times, the Cogiur deems it necessary to utter some reproach, the Nuba feel deeply hurt and ashamed.

IV. CUSTOMS AND HABITS

The men have a girdle around their loins, or they cover themselves with a white cloth. Some wear short trousers in the Arabic fashion, and a gallabia with wide sleeves. Nothing is worn on the head. Their feet are shod with leather soles, tied with thongs. Their wrists are adorned with iron or brass bracelets, whilst from their ears hang one or more ear-rings. Up to and beyond the age of twelve, the young boys are completely naked, but round their thighs they have a cord of horsehair or brass wire. The women have many ear-rings, whilst round their necks they have necklaces of various coloured stones. Enormous brass bracelets, with ten or twelve twists encircle their wrists. A cord round their loins supports a piece of cloth, about two spans in length and width, worn in the front, and sometimes at the back. On solemn occasions or dances they adorn their heads with thin brass plates, and wear bracelets on their ankles. The elder people of both sexes have their hair cut short, whilst the younger let their hair grow long, forming tresses piled one on top of the other, covering the whole of the head.

The Nuba are polygamous but they have no divorce. The husband, according to his circumstances, must give the father-in-law a certain number of cows, goats, and certain quantity of grain.

The Nuba have no industry. They are agricultural and shepherds, whilst their lives are austere and very simple. Their only problem is to obtain the barest necessities of life with the least possible exertion. The work in the fields is light

and quite simple. When the rainy season draws near, the Nuba go to their fields, cut the shoots left from the previous harvest, and clear the weeds. As soon as the first rains fall, they use an ebony tool, pointed like a spear, to make holes in the ground for their seeds. They leave the rest to nature—to make the seeds germinate, grow and ripen. When harvest time approaches, they cut, thresh, and store the grain, as I have already said, in large earthen jars to which they come each day in order to take out sufficient for their daily needs. The rest of the year they spend in weaving mats and repairing their houses. They have no servants except the slaves, and in order to eat, they must work. Each cultivates, for himself, his own field. Their equipment is simple: a shield, several spears, a few rifles, one or more 'angarebs mats made with dom-palm leaves, several *burmas*, or round earthen vases, in which they keep water, flour, and merissa. A few hollowed-out pumpkins, which are used as plates and drinking vessels, a few earthenware utensils for cooking, and finally a *morkhaka*, a stone with which, with the help of another stone, grain is ground.

THE RECOLLECTIONS OF TWO ZANDE CHIEFS

as told to

MAJOR J. W. G. WYLD

I. TOMBU'S STORY

[Tombu, a member of the Vungara, the Zande Royal Clan, was about eighty years old when he gave these recollections to Major Wyld in 1947. He was then completely blind, and claimed to be considerably older than Chief Gangura, who was then the oldest surviving son of Gbudue, the central figure of this story.]

Nyekpati was the first Zande Chief to enter the Sudan.

After the death of his father Basongoda, Nyekpati migrated from the river Mbomu (French Equatorial Africa) to the country now known as Tambura with a following of about ten clans, viz.—

AGITI
ABANDOGO
AGBAMBI
AVUNDUA
ABAGUA
ABIRI
ABAKUNDU
ANGBAPIO
AROKIDA

They occupied this country without opposition ; it was then inhabited by PAMBIA, BUGURU, BARAMBU and BASIRI tribes. They treated these people as their slaves or labourers and referred to them generally as "Auro".

Once the Azande had arrived, they spread and infiltrated in all directions.

Nyekpati gave the country between the river Uele (in Belgian Congo) and the river Sue to his son Renzi. Part of that country was then occupied by a tribe called the Madi, who lived north and east of the river Hu. The Madi alone of all the original tribes put up a fight against Zande incursion.

Nyekpati quarrelled with Renzi about a woman and tried to depose him, but before he had achieved his purpose, Renzi was killed in battle with the Madi. Nyekpati then gave the country to his son Bazingbi who completed the defeat of the Madi. The vanquished Madi Tribe made off into the Belgian Congo. Nyekpati gave the country round about Tambura to his younger brother Liwa (Father of Tambura—grandfather of the present Chief Renzi). Nyekpati died of old age and was buried north of the river Sue ; his grave is well-known and can be seen to this day.

I don't know much more about Nyekpati except that he had the reputation of being a very powerful, great and wise King.

I think I was born about five years after the death of Bazingbi, when Gbudue had already taken over the country (now roughly Yambio Sub-district). My father, Kipa, was a younger brother of Gbudue. He was given the country, now held by Chief Basia Ogbo, by his father and was of course subject to Gbudue.

I remember Gbudue first. As a man of about fifty his "Ngbanga" (Headquarters) was on the river Musukue in what is now Chief Basukangbi's country. He was by no means a genial personality and was held in the greatest awe by his subjects. No one dared to approach him unless bidden. If Gbudue summoned a man, to give him a woman or some spears, the individual might approach, but then only crawling on his hands and knees. Sometimes Gbudue would sit and watch his people if he had given them a feast of food and beer.

Although he was intensly feared by all his subjects he was held in very high esteem and had a great reputation for generosity and wisdom; he enjoyed the greatest loyalty, which is why the Zande fought so well for him. He did not mutilate offenders like most of the old Chiefs, but he had very large numbers executed after his return from captivity at Deim Zubeir. If he had a man killed for adultery with one of his wives or some other offence, he would distribute that man's wives and property to his favourites. Most of his executions were carried out on the high ground just east of what is now the Yambio market. Those put to death were not buried, and their bones and skulls will still be found lying about in the bush in that area.

If you ask me which of Gbudue's sons resembled him most in face and figure, I would say that Basongoda was exactly like him, but Basongoda died before your time. Of the others that you know, I would say Rikita resembled him most, he had the same eyes and figure but Gbudue was somewhat taller and lighter-skinned.

His original name was Yambio which has no meaning as far as I know. He assumed the name of Gbudue after his victory over Nyangi. The name means "to organize or settle"; for example "Irangbi na Gbudue sende" means "The Government organizes the country".

Gbudue was the fourth son of Bazingbi. Ngima, Ezo and Wandu were all his seniors, but he was the favourite son. His succession came about in the following manner.

About five days before his death Bazingbi sent for him in the middle of the night. He told him that he was about to die, he ordered Gbudue not to fight against his brothers Wandu, Maringiindo or Ezo. They were to inherit the countries they then ruled, as independent Chiefs. He said that he made Gbudue his principal heir, he was to rule the country directly governed by him (Bazingbi) which is now the Yambio Sub-district. He also left all his personal property to Gbudue. Bazingbi was buried near the river Masambia, a tributary of the river Nagasi. His grave was never kept up but the spot is still known to a few people.

After the death of Bazingbi, there was little local fighting and the country remained peaceful until the arrival of "Avuru Nangbari", in other words the "KOTORIA" (slavers)[1].

[1] Tombu seems to have forgotten that Gbudue fought successful actions both against Ndoruma and Liwa's brothers who attacked him.

The first of these expeditions arrived when I was a small child. It followed the river Sue from Wau and made a *zariba* near the junctions of the river Mura with the Sue. This expedition was led by a man called "Ngbari"; his second-in-command was a man named "Surumabe". They had muzzle-loading guns. Gbudue attacked them and drove them away. The following year they came again. On this occasion they were guided and assisted by Ndoruma, Gbudue's nephew, and the son of Ezo. Advancing west of the Sue they finally crossed it and came down the river Nagasi as far as the river Musukue. Gbudue again attacked and put them to flight.

The third expedition came under the personal leadership of a man called "Rafail", again assisted and guided by Ndoruma.

This expedition arrived on the scene at the time of the flight of the "Akeodo" or white ants (March) and fighting continued until "Tamvuo" (October). Many Zande were killed.

A heavy action took place at the river Munya, a tributary of the river Nagasi. Chief Gbudue's army was driven eastwards to the river Lingasi. The Zande were heavily defeated on the Lingasi and scattered into groups, but the main body continued to retire eastwards with Gbudue. Rafail pressed on after him. By October Gbudue had been driven as far east as the river Yeta, and here he decided to capitulate. He surrendered to Rafail with his brothers and sons and his personal bodyguard of eighteen "Aboro Mambere". Amongst the princes who gave themselves up with Gbudue was his younger brother Bagboro. When his turn came to be led in front of Rafail, he saw Gbudue there in chains. At this sight he was seized with passion, and drawing a knife killed two of his guards on the spot. Refail was exasperated and took swift reprisals. Bagboro and the other princes together with the eighteen men of the bodyguard were herded together and surrounded by "Bazingeri". The Bazingeri fired volleys upon them which sounded like the rolling of a drum. They all died except two princes and one of the bodyguard.

Rafail took Gbudue and the two remaining princes, Kana and Senango, away to Deim Zubeir. Gbudue's eldest son Mangi had been captured earlier. On Gbudue's advice Mangi was left behind to control the country. A *zariba* was formed on the river Yeta in Chief Kanimara's country (now that of Chief Basipangua). Three detribalized Zande Bazingeri named Sadi, Ngbatiyo and Kubai were left in charge. As soon as Rafail had gone away Mangi attacked and overcame this post, the three Bazingeri escaped and joined Ndoruma in the Belgian Congo where the latter had already returned after Rafail's departure.

Three years passed with Gbudue in captivity at Deim Zubeir. Mangi fought several indecisive battles with Chief Wandu of the Belgian Congo, but these did not result in any territorial changes. He conducted more decisive campaigns against the Buguru and Baka tribes and occupied country east of Maridi as far as the river Iro (now called the Naam) near Mvolo.

At the end of these three years Kana returned from Deim Zubeir and told Mangi that Gbudue was to be released. Mangi collected a party of young men and girls and despatched them with Kana to escort Gbudue home. But the parents revolted at this action of Mangi's, as they thought their children were being led away to slavery. They went after Kana and killed him on the river Sue and brought their children back again.

Gbudue's other son Senango died in captivity. Thus Gbudue came back with three followers only, a Zande who called himself Rafiri, a Bongo called Nyoko, and another man whose name I forget.

On his return Gbudue immediately took over control of the country. He lived first on the river Manzari (now Chief Ukua's country). Then he moved to the river Magaga, a tributary of the river Hu (Chief Zungumbia's country). He spent about three years there, and then moved to the river Bazumburu (Chief Sangba). He spent three years there before moving here to "Birekiwe" (old name for Yambio) where he drank of the stream Li Biro, and his followers of the other surrounding stream-heads. When he settled down at Birekiwe he made a prophecy that he would never move again. He said that Birekiwe would become an important town and that the white men would come; what he said came true.

Some years then passed peacefully, and there were no more slave raiders. The next thing that I remember was an expedition from the Congo led by Chief Renzi (father of present Chief Ngirima of the Belgian Congo). Gbudue took out his army and defeated him at Birisi (near Sakure). About three years later an official expedition was sent from the Congo led by a Belgian named Kure.[1] He made a fort near Bangenze on the river Maiwa (west of the river Sue). Gbudue attacked him with a large force and had many casualties so he desisted and returned to Birekiwe. He sent a message to Kure to say that he would not accept him, because he had heard that the English were advancing from the north. Kure sent Gbudue a present of a roll of white cloth, thereafter Gbudue ordered his followers to leave Kure alone.

By this time a man called Zai had arrived from Wau with messages from the English, but that is another story.[2] Zai misled Gbudue and the result was that instead of receiving the expedition as friends, Gbudue ordered his followers to run away and hide in the forest when it arrived. The expedition was led by an Englishman called Banuere (Boulnois). Gbudue personally followed the instructions that he had given to his people, and made off south. Banuere followed him and chased him across the river Uze to the rock known as Nasue. When Banuere approached, Gbudue fired upon him twice with a revolver. The shots had no effect, but for that reason Banuere fired in return at Gbudue and wounded him in the leg and the arm and took him prisoner. He carried Gbudue back to Yambio and bound up his wounds and looked after him in his own house.

The same night Gbudue told Banuere that he could not stand being a prisoner again and that he preferred to die, and that he would leave his kingdom to his sons. He died the same night.

Ukua, who had already quarrelled with Gbudue (his Grandfather), when he heard that the Englishmen had arrived, seized Zai and took him to Banuere. Banuere had him shot as a traitor.[3] He was buried just beside Gbudue here in your [i.e. Major Wyld's] own garden.

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[1] This must be Lieut. Colin, a member of the Lemaire expedition sent by Leopold II to the Bahr al-Ghazal in 1903–5. "Lemaire fit . . . construire par le Lieutenant Colin . . . un poste sur la rivière Ma-Iawi" (Flament *et al.*, *La Force Publique de sa Naissance à 1914* [Brussels, 1952], p. 344.) [Editor, *SNR*].

[2] This refers to Chief Gangura's story attached.

[3] The reason for Boulnois' very drastic and summary treatment of Zai will be clear from Chief Gangura's story.

CHIEF GANGURA'S STORY

[GANGURA is the eldest surviving son of GBUDUE. Gbudue was originally called Yambio and was the last paramount Chief of the area now known as the Yambio and Iba Ssu Districts of Zande District.]

In the early days of the slavers, one of Yambio's sons called Ngaringari, then a small boy, was carried off to the north by Rafail.

Two years before Boulnois' patrol came to this country a soldier was sent by the English as an envoy to Yambio. This soldier called himself Zai and claimed to be the missing son. He came with his rifle and uniform, also with presents for the Chief, as an envoy of peace, and to invite Yambio's co-operation in the peaceful penetration of the country by the English. He said he had been told to return whence he had come with leopard skins and ivory as a token of good will on Yambio's part.

But Zai was a traitor to the English. He told Yambio not to believe in the honesty of their intentions, for they had made the same kind of overtures in the north where they had seized a Chief called "Kalifa" and his son "Saradin" and put them both to death. Zai said that they would do the same thing with Yambio. Zai said that he had no intention of returning to the English himself, and he asked Yambio to give him a country to rule so that he could settle down amongst his own people. Yambio believed what Zai told him because a number of women claimed that they identified him as the missing son Ngaringari. He was given a small area to rule near the river Makpandu. He paid his rifle as bride price for a Zande girl, and settled down.

Two years later the British patrol reached Yambio. The Chief told his people not to fight but to disappear into the bush. Yambio himself was pursued, wounded in the leg and captured, and he died of his wound. Boulnois made a successful search for Zai, who was finally brought in by Ukua (now an elderly chief) who is a grandson of Yambio. Boulnois executed Zai for his treachery.

[*Note*.—It is reasonable to suppose that Zai's treachery was directly responsible for the turn of events in the Yambio area which led to Chief Yambio's death. A similar envoy was sent to Chief Tambura, but this envoy carried out his mission honestly with the result that there was no incident in that area when the patrol arrived.

It is interesting to compare this story which was recorded not later than 1940 with that of Tombu recorded at the end of 1947. There is virtually no discrepancy.]

BOOK REVIEW

OSWIN KÖHLER: *Geschichte der Erforschung der nilotischen Sprachen. Afrika und Übersee*, Beiheft 28. Dietrich Reimer, Berlin, 1955. Pp. iv + 85, map. DM. 14.50.

This work is issued as a supplement to *Afrika und Übersee* (the successor to the *Zeitschrift für Eingeborenen-Sprachen*), and aptly dedicated to the late Prof. D. Westermann on his eightieth birthday. Dr Köhler, already known for his contributions to Nilotic studies, has now given us a careful and detailed chronological survey (dates are printed in the margin) of the history of Nilotic linguistic research, with full references to published works and manuscripts. In the term "Nilotic" he includes not only the languages generally known by this name (Dinka, Nuer, Shilluk, etc.) but those often named "Nilo-Hamitic" (Bari, Lotuxo, Masai, Nandi, etc.).

The story starts with the year 1812, when notes on Shilluk were contributed to *Mithridates* by J. S. Vater (from researches carried out in Cairo by U. J. Seetzen) and takes us up to 1954, with a mention of Masai texts edited by Prof. A. N. Tucker, and a foreshadowing of the latter's Masai Grammar which appeared in 1955. Nothing of this kind has been attempted before, apart from the bibliographies of Prof. B. Struck (*S.N.R.*, XI, 1928, pp. 217–26) and R. L. Hill (*A Bibliography of the Anglo-Egyptian Sudan*, Oxford, 1939, pp. 156–61). It is far from being a mere catalogue of names and dates: it is a running commentary, full of succinct but significant detail of the labours of travellers, missionaries and linguists in this field, which is such an important one in African language studies. It gives us a fascinating insight into their struggles, frustrations and triumphs, into government policies, and into controversies over classification and orthography. It deals not only with linguistic research in the narrow sense, but is comprehensive enough to include references to indigenous texts, translations, and school books.

The author is to be congratulated on the neat way he has dealt with the tricky task of indexing. There is a good bibliography, arranged chronologically to fit in with references in the text; there are indexes of authors and subjects, and a further well-arranged index in which publications are classified by languages under the headings of General, Phonetics, Grammar, Vocabulary, Texts (traditional), Religious texts and Bible translations, School textbooks. All these cross-references considerably ease the task of the reader.

The definition and classification of the Nilotic and Nilo-Hamitic languages (to use the traditional terminology), their place in African language history, and even their nomenclature, have been the subject of much speculation and debate and the task is by no means finished. Due mention is made of the more recent classifications of Greenberg and others—Dr Köhler's own division is into "West Nilotic", corresponding to the old "Nilotic" group, and "East Nilotic" corresponding to the "Nilo-Hamitic" languages with the exception of Nandi, Suk and their near neighbours, which he labels "South Nilotic". He recognizes, however, that further attempts at large-scale classification and investigation into the remoter affinities of these languages must be preceded by more intensive work on the linguisitc units concerned. Only when more solid groundwork of this nature is done will we be in a position to consider, from a sounder basis, such problems as the relationship of Nilotic to Maban and other languages of the Funj area, or possible wider connections involving Nubian, Daju, etc. The author's net is, in fact, cast more widely than

the Nilotic languages themselves, for there are references throughout the work to a formidable array of non-Nilotic languages, as a glance at the index will show.

In a work which must have involved an enormous amount of research into often barely accessible references it is hardly charitable to speak of omissions, which are indeed very few. One could have wished for a fuller treatment of the Rejaf Conference of 1928, at which important decisions regarding Nilotic orthography were made, and for greater weight to be given to the interest in and encouragement of linguistic studies on the part of the governments concerned, particularly of the Sudan Government which employed Prof. A. N. Tucker as its Linguistic Expert over a number of years. In the field of Bible translation mention should have been made of the New Testaments in Dinka (Bor) and Dinka (Padan) published by the B.F.B.S. in 1940 and 1952 respectively. There are references to Taqali, variously spelt Tegele (p. 25) and Tagali (p. 34) which are omitted from the index.

Dr Köhler's work is a most needed and useful survey of this important linguistic area, achieved in a comparatively small compass, on which the author and the editors of *Afrika und Übersee* are to be congratulated. It would be a great advantage, however, if an English edition could be issued, in which opportunity could be taken of bringing the story right up to date, since it antedates the more recent significant work of Tucker and Bryan. At present readers should supplement it by referring to the latters' *The Non-Bantu Languages of North-Eastern Africa* (Part III of the International African Institute's *Handbook of African Languages*, London, 1956) and accompanying *Linguistic Analyses* (to appear shortly); and to M. A. Bryan's, "The T/K Languages: a new substratum" (*Africa*, Jan., 1959).

It is also to be hoped that, with this example before them, other scholars (or perhaps Dr Köhler himself) will be encouraged to tell the story of linguistic research in other fields of interest to the Sudan, such as Nubian, Beja, or Fur.

R. C. STEVENSON

PHILOSOPHICAL SOCIETY OF THE SUDAN

HON. SECRETARIES' ANNUAL REPORT

For the period 1ST OCTOBER, 1960 to 30TH SEPTEMBER, 1961

1. *Membership*

The membership fell during the year from 164 to 134 : thirty-nine members resigned, almost all of them because they had left Khartoum, or the Sudan, and only nine members were elected. This low intake was largely due to the poor attendance of members (as opposed to guests) at ordinary meetings, which made it impossible to elect new members. At the November 1961 meeting some twenty new members were in fact elected. There has, however, been a net decline (amounting to about ten) in the membership of the Society.

2. *The Sixteenth Annual General Meeting*

The sixteenth Annual General Meeting was held in Room No. 1, Faculty of Arts, University of Khartoum at 6 p.m. on Tuesday, 17th January, 1961.

The following officers and members of the Council were elected for 1961 :—

President	M. Jolliffe
Vice-President	Miralai Abdel Rahman El Faki
Hon. Treasurer	Abdel Rahman El Nasri Hamza
Joint Hon. Secretaries	Hassan Bashir Ahmed G. N. Sanderson
Members of Council	H. Butler J. W. Hill M. O. Bashir Hadi al-Nagar Ibrahim Hassan Allam M. S. Bayoumi Taha Baasher Yusuf Bedri

Past Presidents, *ex-officio* members of the Council:
G. W. Ogden
M. Shibeika
Mohd. Ibrahim El Nur
J. H. G. Lebon

The following changes took place during the season. On the retirement of M. Jolliffe from the Sudan in August 1961, Miralai Abdel Rahman El Faki assumed the Presidency. M. O. Bashir was co-opted as Joint Honorary Secretary in September 1961, *vice* Hassan Bashir Ahmed who had left for a course of study in U.K. In September 1961, J. H. G. Lebon retired from the Sudan and ceased to be an *ex-officio* member of Council.

3. *Council*

Meetings of Council were held in January, February and September, 1961 (the Fourteenth, Fifteenth and Sixteenth Meetings).

4. *Executive Committee*

At the February meeting of the Council the following members of Council were appointed to the Executive Committee for 1961 :—

M. O. Bashir
Taha Baasher
M. S. Bayoumi
G. W. Ogden

A meeting (the fifteenth) of the Executive Committee took place in October, 1960.

5. *The 1961 (Tenth) Annual Conference*

The topic chosen was "Nomadism in the Sudan" and Dr M. S. Bayoumi was appointed Convener.

6. *The 1960 (Ninth) Annual Conference*

The ninth Annual Conference was held on 12th and 13th January 1961, under the high patronage of the President of the Republic. The theme was "Surveying for Development in Sudan" and the Convener Professor J. H. G. Lebon. The Conference was formally opened, on behalf of H.E. the President, by H.E. Lewa Ahmed Rida Fareed, Minister of Works and Mineral Resources. Addresses were delivered to the Conference by Sayid Charley Antoun, Mr P. E. T. Allen, Sayid Magdoub El Banna, Sayid A. L. Widatallah and Professor L. Dudley Stamp. Seven written contributions were submitted to the Conference; and there was an exhibition of maps, photographs and apparatus. Administrative arrangements and publicity were handled by Ustaz Ezzel Din Mamoun, the Shambat Librarian of the University of Khartoum. The Conference was well-attended and aroused keen public interest.

7. *Ordinary Meetings*

Five ordinary meetings were held in the course of the session.

102nd Meeting: 25th October, 1960—55 members and guests present.
Chairman Dr P. Collinson
Speaker Dr R. C. Stevenson
"Linguistic research in the Nuba Mountains."

103rd Meeting: 29th November, 1960—59 members and guests present.
The Presidential Address :—
Professor J. H. G. Lebon
"Some concepts of modern geography in application to Sudan."

104th Meeting: 27th December, 1960—45 members and guests present.
Chairman Dr G. N. Sanderson
Speaker Professor Abdalla el Tayeb
" The Eulogistic Qasida in Arabic Literature."

105th Meeting: 31st January, 1961—55 members and guests present.
Chairman Mr M. Jolliffe
Speaker Professor A. Whiteman
"The Petroleum Prospects of Sudan."

106th Meeting : 14th February, 1961—18 members and guests present.

Chairman Mr M. Jolliffe

Speaker Professor J. Cloudsley-Thompson

"Conflict among Animals."

8. *Special Meetings*

One special meeting was held on Sunday, 12th February, 1961, under the auspices of the Geophysical Section of the Society. Forty-eight members and guests were present.

Chairman Sayid Mahmoud Ahmed Abdallah

Speaker Dr F. Dixey (UNESCO Mission on Arid Zone Problems)
"Rural Water Supplies in Arid Areas."

9. *General*

So far as membership is concerned, the Society continues to prosper ; however, the slight net decrease in membership this year is a sign that efforts in recruiting should not be relaxed. The attendance at ordinary meetings is on the face of it a considerable improvement on the situation in 1959–60, but the attendance of members, as opposed to guests, is at times depressingly small. At the February, September and October meetings in 1961, less than twelve ordinary members were present : as a result no new members could be elected to the Society between January and November. Delays so great must, in the long run, discourage prospective recruits.

The Annual Conference continues to maintain its high reputation for stimulating discussion and efficient organization, and to arouse keen interest among the public.

G. N. SANDERSON,
Joint Hon. Secretary.